U.S. Army Research Institute
for the Behavioral and Social Sciences

Research Report 1735

Development of a Refined Staff Group Trainer

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14. ABSTRACT *(Maximum 200 words)*:

This Staff Group Trainer (SGT) project was a research and development effort sponsored by the U.S. Army Research Institute for the Behavioral and Social Sciences in coordination with the Force XXI Training Program. As a follow-on effort to the previous SGT project, the goal was to refine a brigade-level staff training program to more effectively and efficiently coordinate the activities within and between the individual staff sections in the brigade command post. The program was designed to deliver training to newly formed, inexperienced staffs conducting the staff functions that support the military decision-making process within the execution phase of the brigade area defense mission. Program design and development were based upon lessons learned from the previous SGT effort, structured design methodology, instructional systems design techniques, adult learning principles, as well as team and mental model research.

The refined training program further demonstrated the capability of structured, computer-driven, collective staff training. It advanced the techniques for development of structured staff training and integration of technology into the training process. The program incorporated innovative features including automated performance measures and structured feedback.

This report provides details on the SGT background, design concept, technology development process, training support package development process, formative evaluation techniques, lessons learned, and conclusions.

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Education and Training Technology

FOREWORD

This report documents the methodology and lessons learned in developing the Innovative Tools and Techniques for Brigade and Below Staff Training Program's Staff Group Trainer (SGT) Project. Increasing turbulence and inexperience in brigade staffs, coupled with the high demands on training resources, create a significant training challenge for commanders. This training project provides the commander a tool to meet this challenge. The project is part of the continuing research to establish innovative methods for training combined arms forces by the U.S. Army Research Institute for the Behavioral and Social Sciences. This SGT project was designed to meet the specific training needs for brigade staff functions that support the commander. This effort refines past SGT work, while streamlining and reducing the requirements for overhead training assistance.

The outcome of this SGT project provides training for armored force brigade staffs to support their commander's decision making process in the command and control cycle. The structured exercises challenge the staff to perform its functions in the execution phase of a unit mission. The training project is designed for a newly formed, inexperienced staff. The project bridges the training gap between individual staff member skills and complex collective staff skills, and prepares a staff for more complex simulation-based or field training exercises.

The newly developed features and automated training support packages of this project are directed at providing an easy-to-use system that minimizes the requirements for preparation and maximizes the training value for the commander and his staff.

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Technical Director

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Overall supervision of the project was provided initially by Robert S. Sever, who was succeeded by Dallas L. Long (both of BDM). The Senior Scientist, Dr. Bruce C. Leibrecht (BDM), contributed many hours in reviewing the project's design and report documentation; his efforts significantly contributed to keeping this effort on track. Mitchell S. Greess and Robert Bogardus, software development sub-contractors, and Ronald L. Mast (BDM) were responsible for a significant code writing effort that made the training system a reality. Dr. Kathleen A. Quinkert (Army Research Institute) served as the Contracting Officer's Representative and expertly guided the Team's efforts.

Finally, special thanks go to the Mounted Warfare Test Bed for technical support; to members of the User's Panel for invaluable input; and to the Kentucky Army National Guard (ARNG) and Texas ARNG, whose participation in the pilot and implementation trial helped demonstrate the training program's capabilities.

DEVELOPMENT OF A REFINED STAFF GROUP TRAINER

EXECUTIVE SUMMARY

Research Requirement:

This is a crucial time in the U.S. Army where decreasing defense budgets, turbulence, and the increasing complexity of advanced battlefield technology impact training adequacy across most staff areas. Units need training to be less resource intensive and more focused on the skills they most critically need to achieve true fighting proficiency. This is especially true for staffs, where day to day operations leave little room for battle staff training.

The objective of this Staff Group Trainer (SGT) research and development project was to refine a previously developed, computer-driven, structured military staff training simulation system that concentrated on training at the brigade staff level. The project was based on a staff process model and designed to develop exercises focused on specific staff learning objectives. These exercises were based on critical, doctrinally important activities within and between staff sections in the brigade main command post.

Procedure:

The Team[1] conducted a needs assessment with selected brigade level commanders to determine the precise nature of the training gap between individual staff member training and complex collective staff training for brigade staffs. Using the analysis of this information as a starting point and guide, the Team used the previously developed staff training project concept from past SGT work as a strawman to refine and develop a new exercise library for a set of brigade staff exercises.

Next, the Team reexamined the process by which exercises were developed. Standardized worksheets were created to guide the exercise development process. Using the Area Defense mission, the Team reanalyzed the tactical scenario and refined the library for that mission using a three-level (crawl-walk-run) approach, resulting in tables increasing in complexity.

The project followed an iterative research and development process. Internal testing and refinement of the exercises were followed by a pilot, then a trial. At each step, refinements and modifications were made to the materials and the system based on the participants' comments. The participants were actual intact staffs, drawn from the National Guard.

Findings:

The needs assessment identified the appropriate training focus for the exercises, and the multimedia previews and train-the-trainer packages demonstrated the ability to operate and

[1] The word "Team" will be used throughout the document to refer to the SGT Research Group

evaluate the training without external training support personnel.

The formative evaluation showed that most participants found the exercises appropriately challenging, focused on the correct tasks, and achieving their training objectives. Training feedback, in the form of after action reviews (AARs), at both section and command post levels, was rated as effective by most training participants.

Utilization of Findings:

The refined SGT system represents a necessary link in an integrated staff training cycle that moves all staff members from initial individual proficiency to a more proficient state of combat readiness. New research should continue to demonstrate the contribution of the SGT to staff command and control with particular attention paid to the development of shared mental models. Additional research should also address multimedia and technical innovations specifically focused on improving the value of the refined SGT system to the U.S. Army. The SGT has potential application to training for any problem solving situation which is time-critical and involves interdependent relationships between dissimilar staff agencies, as can be found in disaster or crisis management situations involving natural (hurricanes, floods, fires) or man-made (war, terrorism, nuclear or chemical accidents) circumstances.

This training system concept needs further refinement and development prior to full implementation. Additional work is needed to further define and develop this project into a more "user friendly" and technically-compatible (e.g. common hardware) system for use by commanders in the field. Additional exercises that address typical missions, functional areas, and digital applications should be created to meet the diverse needs of field commanders. Train-up time should be reduced through the refinement of the system's current computer-based instruction technology.

DEVELOPMENT OF A REFINED STAFF GROUP TRAINER

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DEVELOPMENT OF A REFINED STAFF GROUP TRAINER

INTRODUCTION

This report describes the Staff Group Trainer (SGT) portion of a program entitled Innovative Tools and Techniques for Brigade and Below Staff Training II (ITTBBST II). The SGT project was a research and development effort to expand and refine the existing structured computer-aided SGT. Specific program objectives included the following:

1. Design (refine) the existing SGT brigade level training project.
2. Develop a sound, small group (brigade staff) training methodology.
3. Produce sample training support package (TSP) products.
4. Create a training system on the existing training platform.
5. Document the project.

Earlier SGT work demonstrated the structured staff training methodology and its support of the commander's decision making process. Building on the prior SGT efforts, the exercises for the current effort were designed to be progressively more difficult (crawl, walk, run) as specified in Army training policy (Department of the Army, 1988a) and contained three distinct training levels : staff transition exercises (training within a staff section), staff integration exercises (training involving selected sections working together on specific situations), and command post (CP) exercises (training within the entire CP, [i.e., integrated sections]). This report documents the methodology, results, and lessons learned from the conduct of the current SGT project.

Background

The development of innovative techniques represents a major focus of the Force XXI Training Program, which is designed to transform the Army's training capabilities in the 21st century (U.S. Army Training and Doctrine Command [TRADOC], 1994). The Army Research Institute for the Behavioral and Social Sciences (ARI) has conducted extensive research on military performance as it relates to training (e.g., Holz, Hiller, & McFann, 1994). They have collected original data as well as condensing and analyzing volumes of combat training center (CTC) data in an effort to identify those aspects of training which impact unit performance. One body of research, begun in 1989 under the auspices of the Determinants of Effective Unit Performance Research Program (Holz et al., 1994), identified deficiencies in training staff synchronization (Thompson, Pleban, & Valentine, 1994) and determined that battle staff operations correlated positively with unit combat success (Keesling, Ford, & Harrison, 1994). The latter group identified three staff constructs which correlated significantly with force-on-force success: (a) good staff standing operating procedures (SOP) and training on the SOP, (b) staffs which could issue accurate and timely orders, and (c) good staff integration–i.e., staff obtaining, sharing, and interpreting information, and cooperating with one another (Keesling et al., 1994, p. 145).

Most units at the National Training Center (NTC) did not demonstrate proficiency in these staff areas. In fact, commanders and staff officers were interviewed and "a disproportionate number . . . felt they were less than fully prepared to fill staff positions" (Thompson et al., 1994, p. 185). This feeling of lack of preparedness was not without foundation—there was little evidence of systematic staff functional area training during the branch oriented phases of their professional development. Nor did key staff members remain together for long enough periods of time so that they could develop into a highly functional staff (Thompson et al., 1994). To overcome this, Brown (1994) recommended a new training paradigm which would be built around repetitive training situations designed to cue specific individual, staff, or unit behavior. According to Brown, structured modules would train staffs in the basics. These exercise modules would be structured to provide a 'seamless' crawl, walk, run progression and would be followed by situational training exercises, but only after the 'basics' had been mastered.

With the downsizing of the Army over the last several years, high turnover of staffs may be assumed to be worsening. Given the cycle of unit rotations through the CTC, it is realistic to assume that a given staff will have only one CTC rotation together. These training audience characteristics were established during earlier SGT efforts, based on a projected need for this level of training.

Review of Preceding Projects

Of particular importance to the current SGT design was the work which addressed structured staff training in the simulation-based training programs established for the Reserve and Active Components and individual computer-based training (e.g., C. Campbell, R. Campbell, Sanders, Flynn, & Myers, 1995; Graves, Campbell, Deter, & Quinkert, 1997; André, Wampler, & Olney, 1997). Also of interest was the body of work conducted by other ARI elements, the Naval Air Warfare Center Training Systems Division in Orlando, Florida and throughout academia.

This project reflects the progressive development of an innovative training approach designed to support simulation-based staff training. The paragraphs below discuss those individual and collective training programs from which this SGT effort evolved.

Individual Training Program

The current Battle Staff Training System (BSTS) training program was developed as an ITTBBST project. The BSTS training program provides computer-assisted instruction on individual staff skills for commanders and staff officers in armored and mechanized infantry battalions and brigades (André et al., 1997) and contains training packages for principal and support staff officers at both echelons. It provides Army officers with multimedia courseware that enables them to enhance their individual staff skills. This project also served as a source for individual remediation training within the current effort.

Collective Training Programs

General

The Simulation-Based Multiechelon Training Program for Armor Units (SIMUTA), Simulation-Based Mounted Brigade Training Program (SIMBART), and Combined-arms Operations at Brigade Level, Realistically Achieved through Simulation I[2] (COBRAS) programs represent the collective training evolution of the SGT design. These programs are discussed in chronological order.

SIMUTA

The SIMUTA program was developed by leveraging existing and emerging technologies for training (Hoffman, Graves, Koger, Flynn, & Sever, 1995). It represented an early effort to develop structured training and included: (a) standardized exercises, (b) missions divided into structured tables which took approximately one hour to execute, (c) clearly defined unit performance expectations for each table, and (d) after action reviews (AARs) designed to follow each table. Key concepts of structured training include identifying tasks or processes to be trained, using a scenario containing events which will cue the tasks or processes to be trained, and providing feedback on task or process performance.

The SIMUTA program focused on ARNG battalion and below training with the focus on training the execution phase of combat. It was specifically designed to use the Simulation Networking (SIMNET) virtual environment for platoon through battalion level training and the Janus constructive environment and workstations from the earlier ARI Combat Vehicle Command and Control (CVCC) project for battalion staff training (Hoffman, 1993). Three different types of exercises were developed—Janus, SIMNET, and Commander/Staff Trainer (C/ST) exercises. The SIMNET and Janus exercises in SIMUTA were built around two NTC missions (movement to contact [MTC] and defense) while the C/ST exercises used only the MTC mission (Hoffman, 1993). The C/ST's role in SIMUTA was to provide staff officers with training in processing tactically relevant information using replicable, computer-driven exercises.

SIMBART and COBRAS I

The next two programs were developmentally intertwined. Both SIMBART and COBRAS I used the same operations orders (OPORDs) and missions; however, they had different training foci. The SIMBART focused on training a heavy brigade staff in the execution phase of the NTC defensive and offensive (MTC and attack) missions (Koger et al., 1996). The COBRAS I contained training on all three phases (plan, prepare, execute) although roughly 80% of the training focused on the plan and prepare phases, so the execution phase was not as heavily weighted in this program (Graves, Campbell, Deter, & Quinkert, 1997). The SIMBART

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[2] COBRAS I was the first in a series of projects bearing the COBRAS name. COBRAS I was conducted from January 1995 through May 1996. COBRAS II was conducted from October 1995 - March 1997. COBRAS III was conducted from April 1997 through May 1998.

program design applied the structured training methodology to the brigade staff. Just as the SIMUTA lessons learned (Hoffman et al., 1995) influenced the SIMBART development, the SIMBART lessons learned (Koger et al., 1996) indicated potential design changes for consideration in the SGT project.

The SIMBART program provided significant insight into brigade level staff training (Koger et al., 1996). The most relevant issues to the SGT projects were:

1. Staff actions (especially intra-staff activity) are not well codified in military doctrine.
2. AARs need to focus on staff support for the commander rather than on tactical outcomes.
3. There is a need for standardized coaching questions (keyed to exercise learning objectives) for observers to guide staff members during the exercise.

Staff Group Trainer

The most recent SGT effort hosted structured training on a computer network which could automatically collect information on certain trainee behaviors. Drawing from the foundation established during the SIMUTA C/ST effort (Koger et al., 1998), the Team for the prior effort developed a limited set of brigade and battalion-level structured staff training exercises on the execution phase of three NTC missions (MTC, defense, and attack). The exercises in the stages were sequenced to increase in complexity (i.e., crawl, walk, run difficulty levels) as trainees completed the tables, working towards the automation of staff skills. Changes in the prior SGT TSPs were based on SIMUTA/SIMBART lessons learned. Lessons learned during the prior SGT effort also shaped development of the current effort. Key lessons learned from each of these efforts are described below.

One lesson learned relates to Olmstead's modification of Schein's (1965) adaptive coping cycle for organizational processes. Though Olmstead (1992) adapted the cycle specifically to identify, isolate, and evaluate military staff processes; the SIMBART team found it necessary to extend the terminology from Olmstead's academic terms to doctrinally-related Army terms which became the basis of the structured AARs (Koger et. al, 1998). These SIMBART terms (i.e., monitor, process, analyze/evaluate, communicate, coordinate, integrate, recommend, disseminate, and synchronize) formed the basis from which the prior SGT program's learning objectives were developed. A second lesson learned demonstrated the importance of incorporating coaching question guidelines into observer checklists (Koger et al., 1998). This approach was adopted for the current effort with questions designed to keep the unit staff members focused on critical elements of the exercise. Lessons learned from SIMBART also highlighted the importance of structuring AARs around staff performance. Thus, the AAR design for the SGT efforts made a more focused attempt than SIMBART to structure AARs around staff performance. The observer/controllers (O/Cs) were provided prepared slides and a prototype multimedia presentation to facilitate concentration on exercise learning objectives (Koger et al., 1998). A final key lesson learned from the prior SGT effort concerned the focus of training. Comments received during pilot testing and unit trials suggested that the training audience design characteristics were incorrect (Koger et al., 1998). Pilot participants expressed

concerns that the training focus for the earlier SGT effort was inappropriate for the target audience. The training developers also gained insights during the development cycle, some of which were incorporated into the present program.

Problem Statement

A variety of Army programs support training of brigade and battalion staffs. However, for the successful training of unit staffs, training should proceed in a structured manner from individual to small staff groups, then to the integrated staff, and finally to the full unit level (Hall, Dwyer, Cannon-Bowers, Salas, & Volpe, 1993). At this point there is a serious shortage of training tools for units to use in training small staff groups. Without tools to bridge the gap from individual competence to proficiency of full staffs, brigades and battalions are hampered in meeting their training requirements (Brown, 1994).

The prior SGT effort resulted in a program that provided the initial training for staff groups, CPs, and full staffs (the crawl stage of training for staff groups, CPs, and staff) needed to prepare for the less structured staff exercises delivered in the Janus or Brigade/Battalion Battle Simulation (BBS) simulation environment. The current program further refined the SGT user tools to support implementing the training program at the unit's home station, while enhancing the techniques and procedures for assessing staff performance and conducting AARs.

Scope of the Project

The Team conducted a front-end analysis consisting of a literature review and a limited training needs assessment. This provided the developers with an understanding of both the training needs of an armor brigade staff and the unit staff training constraints in the current Army training environment. The SIMBART OPORDs were used as the baseline upon which the trigger event-based exercises were developed. Each complete exercise (preview, preparation, execution and feedback) was designed to be conducted in a four-hour block. The TSP included train-the-trainer (T^3) components, preparation and execution materials, observer materials, and AAR and take home package (THP) materials. The current effort uses the same computer platform as the earlier SGT, with hardware/software modifications to support the delivery of T^3 instruction.

Organization of the Report

The remainder of this report contains the following chapters:

Design - A description of the training project design including decisions that were made and rationales for those decisions.

Training Support Package Development - A discussion of the process for developing the TSPs, including decisions made and results of reviews of the initial products. This discussion includes development of the unit preparation, tactical, and trainer materials and the support requirements for the project.

Formative Evaluation - A description of the formative evaluation process and a summary of key findings during external tests of the training project.

Lessons Learned - A summary of the most important lessons learned during the project.

Conclusions and Recommendations - The findings and suggestions for continued research.

DESIGN

Overview of the Staff Group Trainer Design Concept

Most team training programs do not attempt to teach team skills. Instead, they teach individual skills to a team (Blinkensderfer, Cannon-Bowers, & Salas, 1994). The SGT program was designed to teach team skills and processes to a military staff.

Figure 1 depicts the SGT project as a bridge connecting individual training (accomplished in BSTS) and collective training (accomplished in structured training programs such as SIMBART and COBRAS). Portraying the levels of the SGT (staff transition, staff integration, and CP tables) in ascending order along the arch, the figure demonstrates the stepwise nature of the team skills development process (Brown, 1994; Martens, 1990). At the beginning of the bridge—during the staff transition table—teams focus on the basics (the knowledge level), while at the mature stage—during the command post table—there is a melding of teamwork and taskwork (Bloom, Engelhart, Furst, Hill, & Krathwohl, 1956) such that these activities become indistinguishable (McIntyre, Morgan, Salas & Glickman, 1988). These concepts reflect the Army's crawl, walk, and run operational training approach (Department of the Army, 1988b).

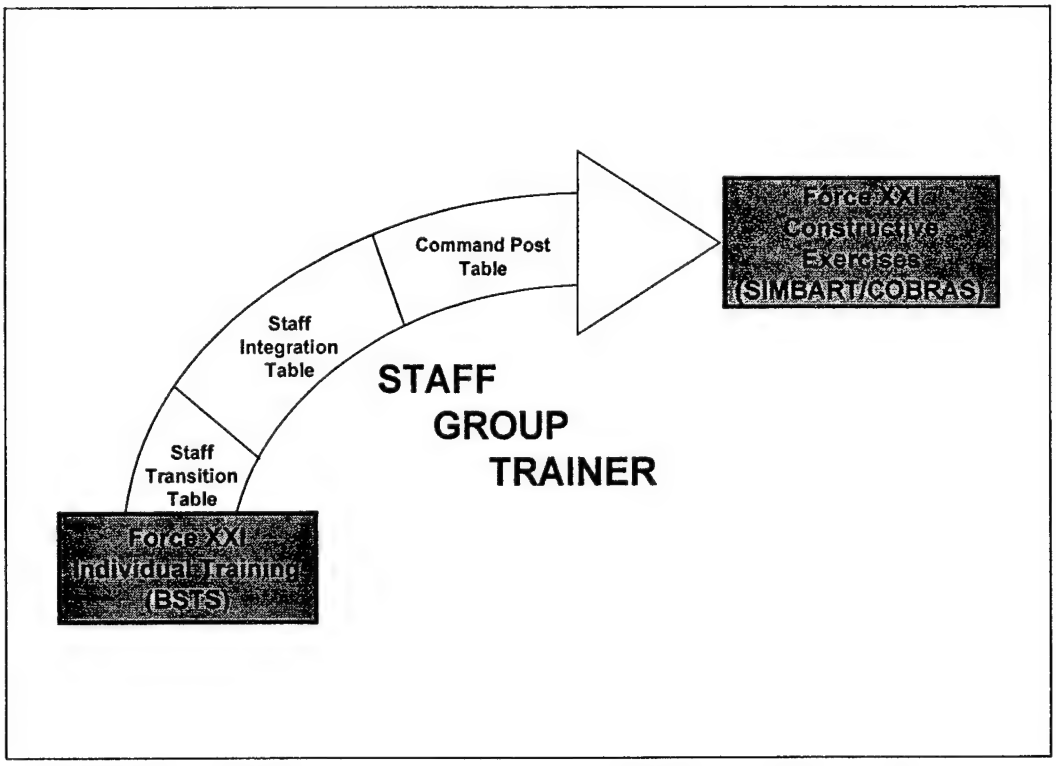


Figure 1. The Force XXI training bridge.

Ideally, staff officers participating in the SGT project have had BSTS training. This training develops an understanding of individual staff responsibilities. An officer's staff section begins with the staff transition table. This table trains the staff members to work together within their sections. The section assesses its performance using the SGT built-in assessment tools and then proceeds when ready to the staff integration tables. These tables focus on training the staff on the required techniques and procedures necessary to integrate their individual staff section functions into those of other staff sections within the CP. As with the staff transition table, each section assesses its performance; however, each section also participates with the other sections in evaluating the staff integration skills. In the culminating tables (CP exercises), the staff sections all work together in supporting the execution of the commander's plan by synchronizing unit actions in response to the commander's directives. After concluding this table, the staff sections conduct both individual and group performance assessments. The commander receives a comprehensive staff performance assessment and action plan which suggests how to proceed with training to ensure unit success in other constructive staff exercises.

Theoretical Support for the Staff Group Trainer

The SGT design is built on research related to teams, team processes, team strategies, teamwork, shared mental models, and adult learning conducted during the last 15 years. The definitions and constructs of this literature which were useful for this project are discussed in Appendix B. The SGT team used this body of literature to establish that a brigade staff constituted a team. This permitted the theoretical models, measurement constructs, and analytic methodologies on teams which appeared in published literature to be applied to the current effort.

The current effort built on concepts and approaches discussed by Bailey, Johnston, Smith-Jentsch, Gonos, & Cannon-Bowers (1995). These researchers provided guidelines for the design of training scenarios with event-based performance triggers, the development of team performance measures, the design of a performance feedback system, and lastly, the development of T^3 training on providing feedback which assists in facilitating the acquisition of teamwork skills. In addition to the Bailey et al. (1995) work, Hall et al.'s (1993) work on team tactical decision making under stress provided this project with a specific approach to the design of structured scenarios. This effort resulted in an Army staff training methodology that incorporated these theoretical concepts and led to the demonstration of its utility with a single sample brigade staff test of the training. The research focused on interactions between critical staff elements and tied the observation and assessment of staff behaviors to specific learning objectives.

Needs Assessment

This effort began with a needs assessment to identify the appropriateness of the proposed training project for the selected target audience. Sredl and Rothwell (1987) state

> Assessing needs is the single most important step in designing human resource development efforts. The reason is simple: all subsequent steps in preparing instruction stem from it. If needs are misidentified, then much time and money

> will be wasted in misdirected efforts. All of the key steps in design . . . will be futile. (p. 5)

Upon the completion of a needs analysis, it is possible to determine the characteristics of the training audience and what the trainees should be able to do upon completion of the block of instruction. While the researcher may establish an initial list of training goals, it is wise to approach those with practical field experience to clearly identify the characteristics of the target population (Dick & Carey, 1985). Thus, the Team contacted Army officers currently serving as brigade commanders, selected for brigade command or with very recent experience (within one year of departure from command). A summary of the interviews is presented in Table 1.

The interview portion of the needs assessment was conducted by video- or audio-teleconference. The Team developed a series of directed questions based on lessons learned in prior SGT work and a review of needs assessment literature (Dick & Carey, 1985; Sredl & Rothwell, 1987) to determine the amount of time and manpower the unit had available to train a brigade staff, the areas of staff action requiring the most sustainment and improvement, and the level of expertise in the staff support process. From the responses, the Team derived a user-based assessment of the training needed by brigade staffs, and how that training might best be delivered.

Staff Group Trainer Training Audience

Based on the needs assessment findings, the Team limited development to exercises for the main CP. The recommended manning of the main CP is shown in Table 2. These individuals represent the approximate number of personnel available in a section for one shift in the Tactical Operations Center (TOC). This allows the commander to focus the training on one shift while other shifts could focus on other duties or be used to support the training.

Training System

The SGT hardware suite consists of seven Sun SPARC workstations linked by a LAN (see Figure 2). Each workstation consists of two 19-inch color monitors, a keyboard, a processor, and a mouse. A military tactical-style map is displayed on the left-hand monitor. A message display is on the right monitor. One workstation is used to control the exercise. When an exercise is executed, this workstation sends pre-scripted messages from the exercise message database over the LAN to the other workstations. Two or more workstations are allocated for support personnel role-playing subordinate units or staffs and higher HQ. The remaining four workstations are allocated across the staff positions—intelligence, operations, fire support (FS), and engineers (ENs). These workstations function as the staff section's map board, staff journal, files, and all forms of communication devices. The system also has a large screen monitor that is used to display the main CP's situation map (SitMap). Each staff section in the main CP can update information to this SitMap.

Table 1

Summary of Interviews with Commanders on SGT Design

Training Area and Issues	Commanders' Recommendation
Training Approach	
Computer-based training	• Develop as many products as possible that can be employed by one person—enable self-paced training, possible exportability, low overhead. • Create user friendly system to encourage/enable maximum usage and impose minimum train-up. • Design system to provide compatibility with home station hardware. Optimize exportability; would like system ultimately to be administered from unit administrative Local Area Network (LAN) in the headquarters (HQ).
Workstation operator, system administrator, and T^3 training	• Enable self-paced training, lower overhead.
Training time available	• Limit training to no more than four hours at any given time.
Training Media	
Multimedia use for previews, AAR, THP, feedback materials, and methodologies	• Ensure consistent, structured presentation, training, and feedback. • Automate training exercise demonstration to ensure consistent, structured presentation and flow of SGT exercise. • Streamline TSP structure to minimize the amount of print materials; combine with redevelopment of training products as multimedia or computer-based to enhance user friendliness and ease of use and reference. • Revise/develop products to support enhanced multimedia/computer-based AAR and THP processes.
Training Feedback	
Commander's Fact Book (Now called Staff Training Profile)	• Change massive master copy model of THPs to an analytical summary of staff performance trends. Seeking to create a more relevant document which is easily used as a training management tool for commander or executive officer (XO).
Training Support Material	
Alternative to issuing complete OPORDs	• Lessen required time for exercise preparation; Providing only essential material defuses the OPORDs quality debate before it starts.
Doctrinal foundation	• Use CTC trends for design baseline only. • Use Warfighter lessons learned since focus is on brigade.

Table 2

SGT Brigade Training Audience: Main Command Post

Section	Personnel
Officer-in-Charge	XO or Battle Captain
Operations (S3) Section	Assistant S3 Officer Assistant S3 Non-Commissioned Officer (NCO) S3 Assistant Logistics (S4) NCO
Intelligence (S2) Section	S2 Officer S2 NCO S2 Assistant
Fire Support Element	Fire Support (FS) Officer FS NCO FS Assistant
Engineer (EN) Section	EN Officer EN NCO

Each section uses their workstation to create, display, and edit various operational overlays on the map display, enabling the staff section to maintain the same type of map-based information as they would in a CP. The message display provides incoming reports in standard message formats. The staff section can read, compose, transmit, forward, and annotate messages going to and coming from other CPs (as emulated from within the exercise system).

Based on lessons learned in previous SGT work, the Team developed software to enhance some of the system's features, increase its reliability, and make it easier to use. These system enhancements are described in Appendix D.

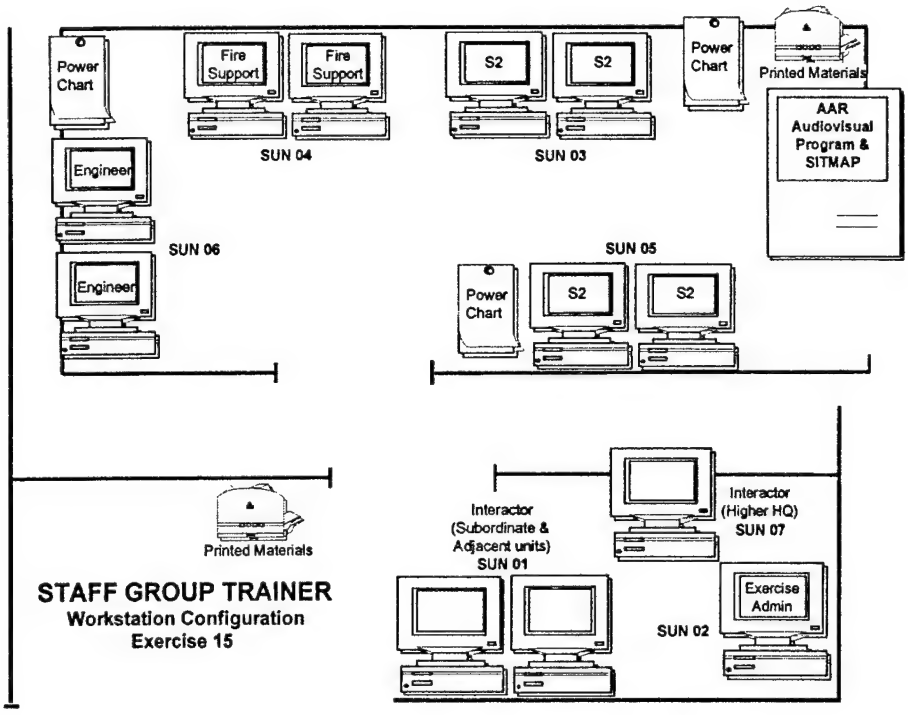


Figure 2. The Staff Group Trainer hardware suite.

Learning Objectives

The learning objectives for the current effort benefited from the earlier SGT and SIMBART efforts which had already incorporated the Battlefield Function analyses (Ford, Mullen, & Keesling, 1997). The SGT learning objectives are shown in Table 3. They reflect the implementation and complete integration of learning objectives through all dimensions of the project.

Table 3

Learning Objectives for the Brigade Training Project

Learning Objective	Description
Monitor unit operations	**Each section** actively seeks information about • higher, • adjacent, • supporting, and • subordinate units.
	Each section acquires information by • listening to reports and • asking for needed information.
Process information and messages	**Each section** • collates, • transforms, and • organizes information.
	Each section stores information on • maps, • situation boards, • journals, and • files. All information can be retrieved and used.
Analyze/evaluate information	**Each section** informally (i.e., a mental evaluation of a recurring report) and/or formally (i.e., a detailed examination of a specific subject, or a staff estimate) attaches meaning, either speculative or confirmed, to information that has been acquired.
Communicate mission critical information	**Each section** transmits mission critical information or intelligence to those who must make decisions about or act on it. This includes initial transmittal of sensed information; relaying; and disseminating throughout the • staff, • CPs, • subordinate units, • supporting units, and • higher HQ.
Coordinate information and intelligence	**Each section** exchanges and discusses information and intelligence with others outside the section to clarify meaning and determine implications.

(table continues)

Table 3 (Continued)

Learning Objectives for the Brigade Training Project

Learning Objective	Description
Integrate staff input	The **XO/Battle Captain** aids the commander's battlefield awareness by: • combining information and intelligence from all staff sections, • putting information and intelligence into a useable format, and • passing information and intelligence to the commander.
	The **XO** or **Battle Captain** identifies areas requiring staff sections to combine efforts to support the commander's intent.
Recommend a course of action	**XO** or **Battle Captain** and **staff sections** develop and analyze courses of action.
	XO or **Battle Captain** recommends a course of action (COA) to the commander.
Disseminate commander's decision	The **staff** prepares and issues orders or fragmentary orders (FRAGOs) to inform units and staff of commander's decision.
Synchronize activities of subordinate and supporting units and direct Battlefield Operating System (BOS) assets to support the commander's intent.	The **XO** or **Battle Captain** in conjunction with **each section** arranges and directs the BOS assets to agree in time or rate, ensuring their efforts are aligned to execute the commander's intent or direction. The XO or BC and each section • track activities of BOS assets and • intervene, if required, to ensure their activities support the commander's intent.

Exercise Library

Though the SGT project developed only a limited set of prototype exercises, the Team conceptualized an integrated training system, consisting of the SGT conceptual mission library shown in Table 4. This library evolved from the integration of known staff training deficiencies as identified by the Center for Army Lessons Learned, the needs assessment field interviews, and related sources. The training exercises are divided into three tables: the staff transition table (which focuses on BOS staff section actions), the staff integration table (which focuses on inter-staff BOS integration skills), and the command post table (which focuses on overall staff performance). All the exercises use the Area Defense mission; it was selected to provide the contextual background, environment, and tactical scenario for the training. A discussion of the decision to use this mission and the specific exercises it contains can be found in the Training Support Package Development Chapter.

The change from a dedicated O/C team and a reduction in the number of training support personnel required the Team to make drastic changes to the program. These modifications were primarily in the area of the training team roles, the T^3 program, and the training team job aids. This section will discuss those changes.

Table 4

SGT Conceptual Mission Library

Exercise Title	Exercise #	Training Audience (Section(s))	Selected for prototype development
Staff Transition Table			
Coordinate support to security force battle	1	Personnel (S1)/S4	No
Execute Reconnaissance and Surveillance (R&S) during security force battle	2	S2	Yes
Monitor execution of security force battle	3	S3	Yes
Coordinate & execute support operations within the Brigade Support Area during security force battle	4	Support Operations	No
Execute FS for the security force battle	5	Fire Support Element	Yes
Mobility/counter mobility/survivability support to security force battle	6	Engineer	Yes
Direct brigade staff during security force battle	7	Brigade XO	No
Staff Integration Table			
Execute R&S Plan Determine enemy main effort	8	S2, S3, BC	No
Mobility & survivability: Establish engagement area	9	S2, S3, BC, FSE, EN	No
Integrate fires & maneuver: Execute engagement	10	S2, S3, FSE, BC	Yes
Force protection: Coordinate passage of lines	11	S2, S3, Air Defense Artillery (ADA), Commander, EN, BC	No
Concurrent Planning: Develop a tentative attack plan during defensive operations	12	S3 (plans), S4, BC, XO, FSE, Signal Officer	No
Command Post Table			
Synchronize combat service support plan	13	REAR CP	No
Alternate Mission, Enemy , Terrain, Troops, Time Available (METT-T) to #13	14	REAR CP	No
Identify counterattack options	15	MAIN CP	Yes
Alternative METT-T to #15	16	MAIN CP	No
Execute FRAGO	17	Tactical CP (TAC CP)	No
Alternate METT-T to #17	18	TAC CP	No

Training Team Roles

Table 5 lists the training team positions and desired qualifications for each of those positions. The SGT team anticipated that the key positions (exercise director, Senior Observer, and possibly the higher HQ interactor) would be filled by the brigade command structure. The

Table 5

Training Team Positions and Qualifications for SGT

POSITION	RANK	QUALIFICATION
Exercise Director	Colonel or Lieutenant Colonel (LTC)	Brigade commander or XO, Experience in brigade staff operations, successful XO or S-3, Command & General Staff College (CGSC) & War College Graduate Armor (AR) or Infantry (IN) branch
Senior Observer	LTC	Experienced in brigade staff operations CGSC graduate AR or IN branch
Staff Observer	Major (MAJ) or Captain or	Experienced in brigade staff operations CGSC or Combined Arms Staff Services School (CAS^3) graduate (CGSC preferred) AR, IN, EN, or Field Artillery (FA) branch
	SGM/Master Sergeant (MSG)	Experienced in brigade staff operations SGM Academy graduate preferred AR, IN, EN, or FA branch
Interactor (higher HQ)	MAJ or	Division or brigade staff operations experience CGSC or CAS^3 graduate (CGSC preferred)
	SGM/MSG	Division or brigade staff operations experience Combat arms experience SGM Academy graduate preferred
Interactor (Subordinate/Adjacent HQ)	MAJ or	Brigade combat arms or battalion staff operations experience CAS^3 graduate
	MSG/Sergeant First Class	Brigade combat arms or battalion staff operations experience Advanced NCO Course/Battle Staff NCO Course graduate
Exercise Administrator (May be one of the Interactors)	Officer Or NCO	Basic knowledge of Windows 95® and Microsoft Office®

staff observer and the other interactor(s) could be members of the brigade staff who were not being trained during the exercise. The exercises were designed for the commander, XO, S3, command sergeant major (SGM), and operations sergeant major to be key people in conducting the training. Involvement of the commander and XO were essential to the training project. These two people must train their staff to meet their own informational needs. Without their involvement, the project would not have the needed direction and feedback.

Train-the-Trainer Program

The change from a dedicated training team at Fort Knox to a training team using brigade assets changed the requirements for the T^3 program. The T^3 program would need to meet the requirements of less train up time, fewer support personnel, and less knowledge about the SGT training system. This combination of constraints was far different (and much more demanding) than for previously developed T^3 programs. The involvement of key members of the brigade command structure as trainers meant that the T^3 program would have to be relatively short, preferably less than four hours. It would have to provide an overview of the program to include the conceptual basis of the program. Because the training team structure would be unknown and possibly come with a diverse skill set, the Team anticipated the need for multiple job aids to assist the training team in conducting the training. The T^3 program would have to focus on familiarizing the team with the job aids and their use in the training program. Since the scheduling of the staff training might be spread over several weeks or even months, some form of refresher training and a section focused on each exercise would have to be provided. Preferably these packages should be designed for computer-based implementation to ensure that information could be delivered consistently and would not be lost or misplaced.

Structured Scenario Design

Numerous investigators (Bandura, 1986; Britton & Tesser, 1982; Manz & Sims, 1981; Norris, 1986; Smith, 1994; Thornton & Cleveland, 1990) have indicated that placing unprepared individuals in a simulation training environment before their basic skills are developed may cause the trainee to miss underlying relationships and learning objectives. To prevent this, highly structured scenarios should be specifically designed to elicit appropriate decision making actions or critical team actions (Hall et al., 1993). The SGT team used a systematic procedure to design scenarios with adequate structure to focus on facilitating the team process learning objectives.

Training Team Job Aids

Because of the structure of the training project and the anticipated inexperience of the unit training team, the SGT team determined that there was a requirement for job aids for most training team members. To get the training started, the exercise administrator's instructions would need to allow for easy initiation of the system and the exercise. The preparation material would have to be scripted and provide simple instructions for use by the training team to immerse the staff into the exercise in a short time. The job aid for the observers would contain prompts on when, where, and what to look for in terms of specific staff actions in response to the system delivered message cues. The interactor cell would be provided job aids with very specific

guidelines on how to respond to requests for information (RFIs) from the staff sections. The information to answer these inquiries would be easily retrieved during the conduct of the exercise. The section and exercise AARs would be easy to follow and focused on specific learning objectives for each exercise. The following sections discuss the exercise segments and some of the ways the design addressed the needs of the training.

Exercise Segments

The SGT project team organized the exercises into segments to facilitate exercise development and administrative control during execution. These segments began when a unit was at the site and had made its preparations for conducting the training program. Each exercise was broken into three segments: (a) exercise preparation (actions taken prior to the start of the exercise which provide background and final coordination opportunities), (b) exercise execution (actual running of the simulation from start to finish), and (c) exercise feedback (AARs and self-assessment activities).

The following subsections discuss the design of these three segments. The methods for developing the indicated materials are discussed in the Training Support Package Development Chapter.

Exercise Preparation

The SGT team's design aligned closely with Brown's (1992) approach. Therefore, the SGT design was based on the premise that the staff could receive a thorough grounding on the specific and general situation for the exercise and become immersed in the battle context in 30 minutes or less. The Team divided the exercise preparation into three parts: exercise preview, section preparation, and pre-execution staff huddle. The following sections explain the SGT design for these three parts.

Exercise Preview

The exercise preview aligned closely with Brown's (1992) general situation. The SGT team envisioned the general situation summary to be a short battle summary to the entire staff, consisting of: (a) what had led up to this point in the battle, (b) what to expect in the exercise, and (c) a description of the exercise learning objectives.

Based on the success of the multimedia preview created previously, the design concept was that this should be primarily a multimedia presentation. However, the designers also wanted this multimedia preview to provide an opportunity for the commander to state his expectations for the staff and to emphasize the learning objectives on which he wanted the staff to focus. They expected the commander to focus on his expectations concerning critical pieces of information he needed (Commanders Critical Information Requirements [CCIR]) or a recommendation based on the staff's analysis of the situation that he would expect. The previous SGT team had allowed the commander to present this portion of the preview, but had not helped the commander to focus on the exercise learning objectives. Additionally, the SGT was designed to be more turn-key. As a result, the Team decided this portion of the preview would also be presented in the

multimedia format but would then allow the commander the opportunity to highlight certain aspects or explain how he wanted the information presented to him. The concept allowed the Team to ensure the information was presented. At the same time, it provided the commander an opportunity to personalize the presentation. The intent of the preview was to stress the plan and the shared situation model or shared mental model. The focus on the CCIR, Decision Support Template (DST), and synchronization matrix highlighted the shared model and the staff's roles and responsibilities.

During the preview, the staff also would converge their action plans from a previous exercise with the specific situations presented in the preview. Specifically, this part would include a review of the action plan prepared in an earlier exercise with a look at how this plan would be applied in this exercise. This review would not be conducted if this was the first exercise the staff was conducting. Either the commander, XO, or battle captain (BC) would conduct this part of the exercise. The designers allotted approximately 10 to 15 minutes for the entire exercise preview.

Staff Section Preparation

The staff section preparation component was designed to get each individual staff officer and small staff team fully immersed into the exercise as conceived by Brown's (1992) "specific situation" notion. Earlier SGT lessons learned had demonstrated that this would be difficult. Lack of a dedicated O/C team and the need to adequately prepare the unit-provided training support personnel made the simplification of the preparation training requirements a necessity. As a result, the designers would need to make the preparation much easier to implement.

Structured training often includes the use of a previously prepared OPORD for the exercise(s). The staff executing the SGT OPORD was not involved in the preparation of the OPORD and the analysis that went into the development of the OPORD. Part of the staff preparation must take the staff quickly through specific parts of the OPORD to better understand why certain decisions were made. The Team decided that this in-depth preparation would best be conducted by each section individually, with the section personnel examining the tools they would have developed (e.g., synchronization matrix, DST, power charts, CCIR, priority intelligence requirements and which they will need to use during the exercise). This was done using self-contained Visual Basic© programs customized to the needs of each staff section for a given exercise.

The designers allotted approximately 30 minutes for staff section preparation. In the pilots and the trials, this amount of time was only needed for the first iteration. Subsequent iterations took only 10-15 minutes.

Pre-Execution Staff Huddle

The third stage, pre-execution staff huddle, did not come from Brown (1992). Rather, it evolved from the research on shared mental models and effective team leader practices (Orasanu, 1990; Orasanu & Salas, 1993). This phase allows the XO or BC to gather his principal staff officers within the main CP and ensure they understand his and the commander's expectations

for the upcoming exercise. As a result of this pre-execution staff huddle, each staff officer should come to share the mental model of the commander and XO, and understand his role and expected contribution.

Exercise Execution

Level of Difficulty

The designed exercises needed to be challenging while providing a high likelihood of success. The challenge of the exercises must match the ability of the participants. This is referred to as the "flow" experience (Martens, 1990, p. 45). When the challenge of a task exceeds the ability of the participants, the participants become anxious or frustrated. When the challenge is below the participants' ability, they become bored. However, when the challenge of the task matches the ability of the participants, the participants become caught up in or "immersed" in the activity. According to Martens this is when the "flow" state is achieved. Berliner (1985) found that participants do not have to be successful all the time to be in this flow state, but have to believe they have a high likelihood of success (successful about 75 to 80% of the time). Higher success rates may lead some participants to feel the exercise is not challenging enough.

Achieving this flow state in training is complicated because staffs and staff sections are often not at the same level of training. A large set of seamlessly integrated exercises is required to achieve the flow needed for a robust and varied training environment. This program provides a discrete subset of these exercises needed to prove the concept.

System or Interactor Created Cues

The SGT messages are designed to provide the cues (e.g., spot reports from subordinate units; intelligence reports from higher HQ) to the staff members which will elicit the desired behaviors that achieve the learning objectives. The critical messages act as the superstructure within the exercises that keep the participant within the "flow" window. These messages represent realistic (tactically correct and doctrinally sound) events, and are appropriately timed to keep the exercise at the correct pace. Through the table-to-table progression, cues elicit more complex staff processes, thus increasing the level of difficulty. This was intentional, bracketing the exercise within the challenge/ability flow while maintaining the crawl-walk-run training philosophy. This heavy reliance on the system to provide cues simplifies the training team requirements.

Coaching

There is a significant need for coaching to provide clues to the staff on their expected performance during execution. Especially in the early tables, coaching furnishes reminders to the staff on what they should be doing throughout the exercise. In SGT, coaching is provided by observers, using questions and checklists automatically cued up on personal digital assistants (PDAs). Tied to the events, these questions are specifically linked to the actions of each staff/staff member, based on the learning objectives and the mission/tactical situation. They

provide important hints to spur the appropriate staff activity and keep the staff on track. This system simplifies the observers' tasks, making train-up and execution much less time consuming.

Exercise Feedback

General Design Concept

The Team designed the AARs and trainer instructions so that feedback to the staff would focus on the performance of staff actions. The feedback goal was to praise good performance and avoid harsh criticism of poor performance. This feedback design supported building and maintaining high self-esteem in the participants. Bandura (1986) found that expected outcomes depended heavily on a person's self-confidence in their ability to perform a skill. The SGT feedback design also supported the adult learning concept that to maximize learning, instructional strategies should provide a climate that is supportive and that avoids unpleasant experiences or threats to self-esteem (Laird, 1985; Marshak, 1983; Sredl & Rothwell, 1987; Wlodkowski, 1985a, 1985b; Zemke & Zemke, 1981). This was done using Johnson and Johnson's (1994) suggestions that feedback should focus on how team members are functioning as a team. This also meant that the team should examine their actions and decide what they wanted to sustain or improve.

Section After Action Review

Commanders indicated that the number of support people required for the training should be reduced to four or five. To achieve this, the SGT team eliminated some of the section observers and expanded the role of the training participants. This meant that the Team had to look for different methods to conduct section AARs. Blickensderfer, Cannon-Bowers, and Salas (1994) proposed four techniques to foster and train self-correction. These four techniques were: (a) provide time for team discussions, (b) model and role play feedback, (c) use a facilitator to record important incidents or specific times when performance faltered, and (d) have each team member complete ratings of the team's performance on various dimensions and then discuss and compare the ratings. The SGT team adopted these techniques (except for model and roleplay) as part of the section AAR process. This was implemented using a Visual Basic© program that leads each section through an individualized exercise review.

The individualized exercise review program was designed and developed using techniques identified by Smith-Jentsch, Payne, & Johnston (1996). In conducting research in guided team self-correction, a guide was developed which "summarizes each event (what actually happened), provides open-ended questions regarding targeted behaviors (positive and negative) organized by teamwork skill, and provides a format for setting goals under each teamwork skill" (p. 18). They found that this method enhanced the learning of the teams that used it in an actual shipboard setting. The Team adapted this method of exercise review to the SGT training environment to ensure that the section AARs followed these steps.

Exercise After Action Review

The commanders indicated that they wanted a more focused AAR than they were receiving at the CTCs. They agreed with the concepts provided by the Team during their discussions; these concepts corresponded with the feedback guidelines in Bailey et al. (1995). The Team decided to use the recommendations for the exercise AAR debriefing guide (discussed earlier in this chapter) to make a multimedia presentation and guide for use by the senior observer and commander when acting as a training facilitator during the AAR.

Commander's Staff Training Profile

The user panel commanders indicated they needed a THP that was concise and focused. With this in mind, the Team designed a package which contained information gathered from the computer instrumentation, the section AAR, the exercise AAR, and the observers. This was provided to the commander before leaving the training site. The information consisted of: (a) a record of the commander's training goals, (b) the commander's selection of criteria for the exercise AAR, (c) a copy of data and user input from the section AAR (to include the self-assessments), (d) a trends analysis of staff performance from the instrumentation (primarily, message handling and actions taken over the course of the exercise), (e) a summary of the findings from the exercise AAR, and (f) a staff-prepared Action Plan from the exercise AAR.

The important outcomes of the design were the operationalization of theoretical principles into specific, useable, training feedback products. The most important of these were the window of opportunity (WOO) and the staff fingerprint. These products provide the basis for the actions taken by the staff members in the conduct of their activities. A discussion of these products and their place within the SGT training system is in the next chapter.

TRAINING SUPPORT PACKAGE DEVELOPMENT

Structural Organization

Packaging Style

The SGT TSP contained paper-based, computer-based, and multimedia products (i.e., T^3, workstation operator training (WST), message databases, previews and AAR materials). Table 6 shows the structural organization and delivery format of the SGT TSP.

Table 6

Structural Organization of the SGT TSP

TSP Component	Delivery Format
Program Orientation Guide	paper-based
Brigade Training Guide	paper-based
Brigade Tables with End of Exercise (ENDEX) Power Charts	paper-based
Workstation Operator Training	Electronic
Train-the-Trainer Module	electronic and paper-based
Brigade Tactical Materials	electronic

The SGT TSP was organized to enhance user friendliness for the trainers and training staff, reduce overhead costs, and foster maximum automation. Tactical materials were moved to an electronic format (MSWord®) and scanned bitmap images. Fewer printed training materials and training tools were required due to SGT's use of electronic products (e.g., observer checklists and tactical materials). In addition, since only one exercise per table was fully developed, there was no need to produce a separate hardcopy volume for each table. The training unit has the option to print the tactical materials from the electronic format as required.

Writing Style

Structured writing makes TSPs easier to use than the more traditional, prose-style approach (Graves & Myers, 1997; Koger et al., 1996) and is mandated by TRADOC (Department of the Army, 1995a). Consequently, structured writing has been used in preparing the paper-based components of all SGT TSPs. This writing style emphasizes (a) separating information into small units by purpose and function so it may be easily read and understood, (b) sequencing information based on its use and need, (c) labeling topics for easy scanning, and (d) presenting information in modular units so it can be easily modified (Horn, 1995).

Innovative Approaches to Solve System Training Issues

The results of the needs assessment established the user's requirements and standards within the framework of the current effort's manpower, time, and equipment constraints. It was the need to create a staff task training system that shaped the requirement for new technology uses. The innovations taken by the Team to solve these problems are shown in Table 7. Each item includes

a brief description of the technology, the reason or source for its inclusion on the list, and a brief discussion of the implementation approach.

Table 7

Innovative Approaches Incorporated in the SGT Training Program

Training Reason/Needs	Implementation Approach
• **Ease of operation**	
Simplified exercise administrator's job	• Menu driven Graphical User's Interface to make operation easier, similar to a Windows environment. • Avoid use of UNIX editor.
Simplified workstation operations	• Map edit functions streamlined/simplified so icon placement and other functions are faster/easier. • Map Display automated to update actions. • Map Edit Screen simplified to reduce time it takes to complete task. • Unnecessary functions removed.
Simplified interactor interface	• Voice recognition* and touch screen for interactor workstations to enable interactors to more efficiently answer RFIs.
Hard copy materials reproduction	• On site printing of TSP training tools for specific staff sections.
• **Facilitation of training**	
Graphic feedback approaches	• WOO to emphasize the learning objective—communicate—to document activities taken by staff at that workstation regarding the key message, including reaction time to get information to commander. • Staff fingerprint graphic to show how key messages were handled for selected learning objectives (monitor, process, analyze, communicate, and coordinate).
THP usability	• THP converted to "fact book" to get away from massive CTC model. (20 pages or less in length). • Tabular/graphic document design to show user performance trends and link to Mission Training Plan (MTP)/Tactics, Techniques, and Procedures (TTP)/program learning objectives.
T^3 tutorial	• Computer-based instructions for operating workstations and implementing the training program, using MS Help®.
Large group exercise multimedia previews	• Computer-based previews provide training staff with overview of battle situation (places them within tactical context).

(table continues)

Table 7 (Continued)

Innovative Approaches Incorporated in the SGT Training Program

Training Reasons/Needs	Implementation Approach
Staff section preparation materials	• Computer-based presentation of information requirements critical to successful staff section performance.
• **Training flexibility** Restrictive terrain database*	• Design and development of exercises sited restrictive terrain (e.g. Korea) thus to vary METT-T during execution.
• **Enhanced turn-key operation** Automated section AAR	• Automation of section AAR at each workstation to facilitate self assessment of performance.
Automated observer's checklist	• Small hand-held computer to automate data dump from O/Cs and for unit self-assessment ratings and self-generated action plans.
Audio-visual orientation*	• Introduction to provide trainers and training staff short video-tape orientation .
• **Face validity** Fax emulation	• Use of printers for long messages that are normally delivered via fax machine in field CP.
Army Tactical Command and Control System (ATCCS) emulation*	• Development of ATCCS 'look and feel'.

* These recommendations were investigated but not implemented during this project. Given the cost and technical difficulty, they were not deemed critical to the demonstration of the small group (staff) training approach.

Exercise Development Methodology

The SGT TSP development process used a codified exercise development methodology modified from the structured, simulation-based training methodology (Campbell et al., 1995). The Team split the TSP development into two phases: exercise feedback materials development and exercise materials development. This was done because of the immense volume of exercise material which needed to be developed and front-loaded into the SGT computer system (i.e., message traffic and RFI guidelines). This approach allowed for a more concentrated emphasis on integrating each step of the development process with the project's learning objectives (see Figure 3).

The subsections that follow are keyed by number to the blocks in Figure 3. While the diagram suggests a sequential execution, the steps often overlapped. In addition, the development of exercise materials and the development of feedback materials occurred concurrently (especially in the latter stages of the project), as the results of material development directly provided input to the AAR development process.

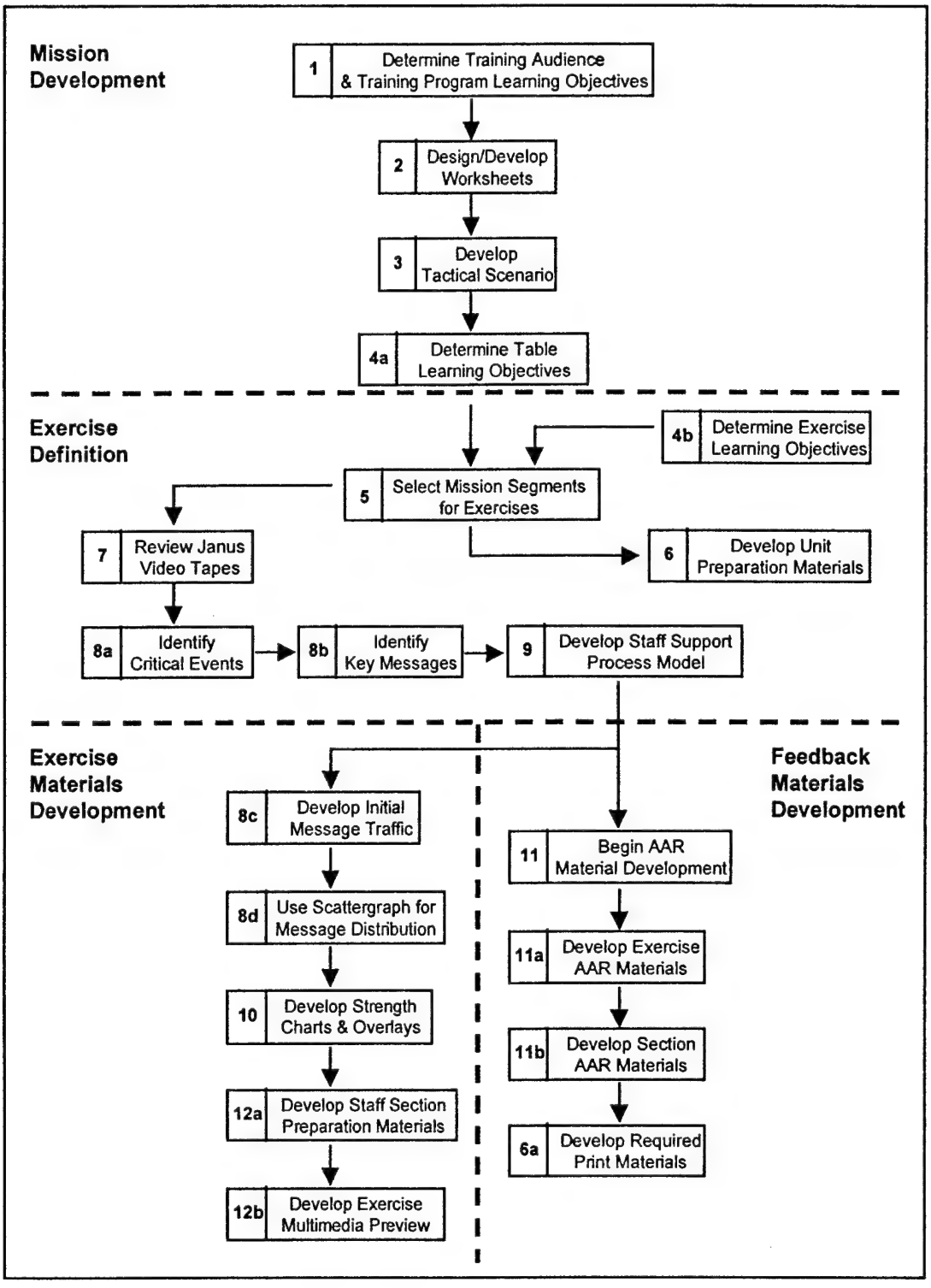


Figure 3. SGT development flowchart.

Mission Development

Determine Training Audience and Training Program Learning Objectives [1]

The methods for determination of the training audience and development of the learning objectives for this project were discussed in the Design Chapter of this report.

Design/Develop Worksheets [2]

The Team employed a systematic, structured methodology to standardize production. With the guidance of the instructional systems design (ISD) specialist and use of structured writing, a series of development worksheets were created for the exercise authors. These worksheets helped the authors capture the components necessary for consistent and quality exercise development and maintain an organized record of progress. Worksheets for each of the following topics were developed:

1. Exercise Preparation (including learning objectives, tactical scenario, and assessment plan)
2. Required Print Training Materials
3. Exercise Preview
4. Instructions to Multimedia Developer for Exercise Preview
5. Staff Section Preparation
6. Feedback Strategy
7. Key Messages and Required Staff Actions
8. WOO
9. Overlay Comparison
10. Power Chart Comparison
11. Staff Section Self-assessment
12. MTP/BSTS Remediation
13. Staff Support Process Module
14. Observer Checklist
15. Instructions to Software Developer for Staff Section AAR
16. Instructions to Multimedia Developer for Exercise AAR
17. Exercise AAR (including commander's Comments, Techniques and Procedures for Exercise AAR, Sustain/Improve Menu for AAR, and Learning Objectives Self-assessment for Exercise AAR)
18. Pre-execution Staff Huddle Guidelines

Develop Tactical Scenario [3]

The Team selected the area defense as the sole tactical scenario for the exercises. This mission was identified as being the most challenging in both preparation and execution, thus providing a complex set of circumstances which would enhance training for all staff members. In addition, the area defense provides unique opportunities to attend to preparatory activities by all the individual staff members, as well as integrating actions between staff sections. There were also clearly defined parts which would lend themselves to partitioning for individual

exercises. These exercises, designed as individual vignettes under the umbrella of a common tactical scenario, best support learning objectives tied to the critical, tactical events within each exercise.

Determine Table Learning Objectives [4a]

Training a staff section in the nine identified staff functions necessitated a progressive "building block" approach suggested by Brown at the SIMUTA proof-of-concept test (F. Brown personal communication, September 14, 1994). The SGT program is divided into three distinct tables, each involving an increasing level of difficulty (staff transition, staff integration, and CP tables). The learning objectives of the staff transition table (monitor, process, analyze, and communicate) did not depend on more than limited interaction with other staff sections. This aspect of the project allowed staff sections to be trained independently, yet concurrently, using the same computer-generated message list. The next set of exercises, the staff integration table, involved training selected, integrated staff sections (e.g., a targeting cell made up of the XO, S2 and fire support officer) to collectively perform increasingly difficult learning objectives (analyze, communicate, coordinate, and integrate). Finally, the command post table trained all staff sections of the Main CP to perform higher level staff tasks (analyze, communicate, coordinate, integrate, recommend, disseminate, and synchronize), focusing on helping the full staff develop synergy in its operations.

Exercise Definition

Determine Exercise Learning Objectives [4b]

The content and time-frame of each exercise was determined by selecting the events that would best elicit the performance of learning objectives from the training audience, be it individual staff section or integrated staff sections within a CP. While all tactical events need not be played out in order to ensure the desired staff performance within any given exercise or table, a chronological progression through the area defense mission offered greater continuity in learning. The Team produced a multimedia exercise preview for each exercise selected for development to reaffirm the training audience's understanding of the mission and reacquaint them with the learning objectives for each exercise.

Select Mission Segments for Exercises [5]

One of the most time consuming and critical development tasks is to select the segments of the tactical scenario which best support the learning objectives. Exercise authors examined the tactical scenario, conducted a task analysis of crucial points in the battle, and determined the specific times in the scenario when events could be built into the play to trigger critical learning objectives. It was important to keep the battle flow continuous within each exercise.

The Team designed the staff transition table to train only the first four learning objectives. The exercises chosen focused on a period in the tactical scenario without heavy enemy contact: the counter-reconnaissance/security force battle. Being relatively short and simple, these

exercises allowed the staff to master the initial objectives and get accustomed to the training system.

The next exercise set, the staff integration table, focused on the brigade's contact with the enemy first-echelon forces. This tactical scenario segment was chosen because it required the staff to begin interaction between sections, as well as with higher and adjacent units.

The culminating exercise set, the command post table, focused on identifying the commander's options for a counterattack in the main battle area. This tactical segment represents an intense period of enemy contact. It required the staff to become fully interactive between sections, as well as with the BC, and the adjacent, subordinate and higher units. Most importantly, it provided input to the brigade commander to support his combat decision-making cycle.

Develop Unit Preparation Materials [6]

The SGT unit preparation materials consist of the Orientation Guide, Training Guide, Brigade Tables, Workstation Operator Training (parts one and two), T^3 Program of Instruction (POI), and Brigade Tactical Materials.

The Orientation Guide provides a complete overview of the SGT project for interested brigade commanders who would potentially choose the project as a training option for their staff. It summarizes the training goals and provides a general description of the SGT training program, and includes information on training strategy, hardware, and the TSP.

The Training Guide is intended for use by trainers in a unit committed to using SGT. It expands the Orientation Guide by more specifically describing the training audience, training goals, learning objectives, tables, training strategy, and trainer requirements.

The Brigade Table book describes the structure of brigade staff group training, brigade SGT trainer tables, and the exercises within them. The book is divided into four parts; the training program structure, the staff transition table, the staff integration table, and the command post table. This book contains exercise-specific information for administering and conducting brigade exercises.

The T^3 POI was developed to instruct personnel assigned as trainers to effectively administer and facilitate brigade exercises. The training audience for this POI consists of the brigade commander, brigade XO, exercise director, exercise administrator, workstation operators, interactors, and observers

The WST portion of the T^3 POI was developed to meet requirements of field commanders as expressed in the needs assessment. They asked for an easily exportable system, which would not require a lot of training to learn to use. The developers assumed that, since the Army standard desktop is an Intel processor running Microsoft Windows (95® or NT®), any software developed to run in this environment would require minimal outside assistance to use. Microsoft Help® was chosen to develop the tutorials for the following reasons: (a) the appearance of information

matches that with which users of the Windows® environment are familiar, (b) it is simple to modify, and (c) tutorials developed with this are easy to distribute and use.

Currently, the WST package consists of two separate programs. The WST 1 program is for use at homestation, while the WST 2 program is for training on site. The WST 1 program provides ample system background to permit the workstation operator to arrive on site and work through the full tutorial. (Detailed UNIX implementation instructions are not contained in the WST 1 program, since practicing them requires the Sun systems to be present.) On the first day the unit utilizes the SGT system, the WST 2 tutorial allows workstation operators to practice skills at their respective workstations.

The tactical materials consist of the division and brigade OPORDs with overlays, and a brigade SOP extract. This is the only area where a unit may make appropriate adjustments to fit their particular unit specifications.

The exercise training materials were developed to support the pre-execution staff huddle. This is a "last minute" meeting where the XO gathers the main CP staff to ensure that each staff section understands the commander's vision, expectations, and intent for the battle and for each individual BOS. It normally lasts only a few minutes and involves the XO and/or BC, and at a minimum the staff section officers-in-charge/non-commissioned officers-in-charge. In the SGT environment it occurs near the main CP SitMap. The XO and staff are provided the maps and overlays needed after the individual staff section preparation activities are completed but prior to the exercise commencing. Developers organized a T^3 pre-execution staff huddle guide. This guide is a series of BOS-specific questions based on information found in the DST and the synchronization matrix of the OPORD. It provides the XO or BC with information to personally verify that his main CP staff is well grounded in the operation and is alert for specific cues throughout the battle.

Review Janus Video Tapes [7]

As an important step in the exercise definition process, the Team executed a Janus version of the area defense exercise, as dictated by current tactics and doctrine. The exercise was saved and played back for review. A video tape of the exercise was also made and reviewed in detail. This process provided valuable insight into the timing of events and activities within the mission. It also allowed the Team to verify the time/distance factors of the forces on the battlefield and provided additional input in determining tactical outcomes and events. This exercise served as a basis for determining battle damage assessment (BDA) and other related battlefield information in SGT.

Identify Critical Events [8a]

Each exercise was custom constructed to set the stage for the staff to perform the desired learning objectives. The Team used worksheets to identify and record the exercise's critical events. Exercise critical events are defined as actions in the tactical scenario that cue battle staff functions in support of the command and control (C^2) cycle (Department of the Army, 1995b). The Team classified an exercise critical event as an action which causes employment of DST

criteria, requires a staff BOS activity on the staff synchronization matrix, or answers a CCIR. First, the exercise author listed each staff action within the exercise, which staff sections were affected, and whether or not the action supported a DST criterion. Second, the author selected staff synchronization activities that related to those staff sections that comprised part of the training audience, but not having DST supporting actions. Next, the author linked each event to an exercise learning objective. Last, the author combined or deleted critical events as necessary, stating the rationale for doing so. The resulting list became the exercise critical event list, which drove the development of the message traffic.

Identify Key Messages [8b]

The Team modified the area defense message traffic database from the prior SGT to support the design concepts of the SGT exercises. This entailed making additions, deletions, and content changes. The critical events identified within each exercise had to be supported tactically. The exercises had to be built around the desired learning objectives identified for each exercise, ensuring that each staff section received the quantity and quality of messages that they could realistically expect to receive from appropriate BOS-specific sources within the prescribed tactical scenario. Once the exercise messages were finished, developers systematically determined each exercise's key messages; these provided the cues which defined the exercise's critical events in a systematic manner. This required the developers to run several quality assurance dry runs to ensure all participants were exposed to a flowing exercise. These key messages were also used to develop the observer checklists, to tightly focus the observer on what staff actions should be happening at a given point in the exercise.

Develop Staff Support Process Models [9]

The staff support process model, or "mind map" (see Figure 4), is a pictorial or graphic displaying an exercise's critical events, a brief summary of the key messages that develop each critical event, and a flow diagram showing (in terms of the learning objectives) the staff sections' expected distribution of the information contained in the key messages. These "mind maps" were developed for each exercise for two purposes: (a) to use as a flow chart or "story board" for the Team in the creation of the exercises and tables and (b) to serve as job aids for the observers to help them understand the Hierarchical Input Process Output sequence or cause and effect chain of the exercise.

Exercise Materials Development

Develop Initial Message Traffic [8c]

The Team used, as a baseline document, the consolidated message list for the brigade area defense scenario developed during the previous SGT. In the developmental stages of the earlier effort, that Team employed a map exercise, augmented by a videotape of a Janus run, and the DST and synchronization matrix to determine the type of message traffic that should be received by the training staff from subordinate, adjacent, and higher units or staffs. The Janus videotapes provided the development team with verified activities, times, locations, and strengths of enemy and friendly units. They collected this information into a message summary database. This

database included time, message type, a key message identifier code (visible to developers only), message originator, addressee, radio net, and a message summary. Based on the message summary database, the Team constructed the message traffic database.

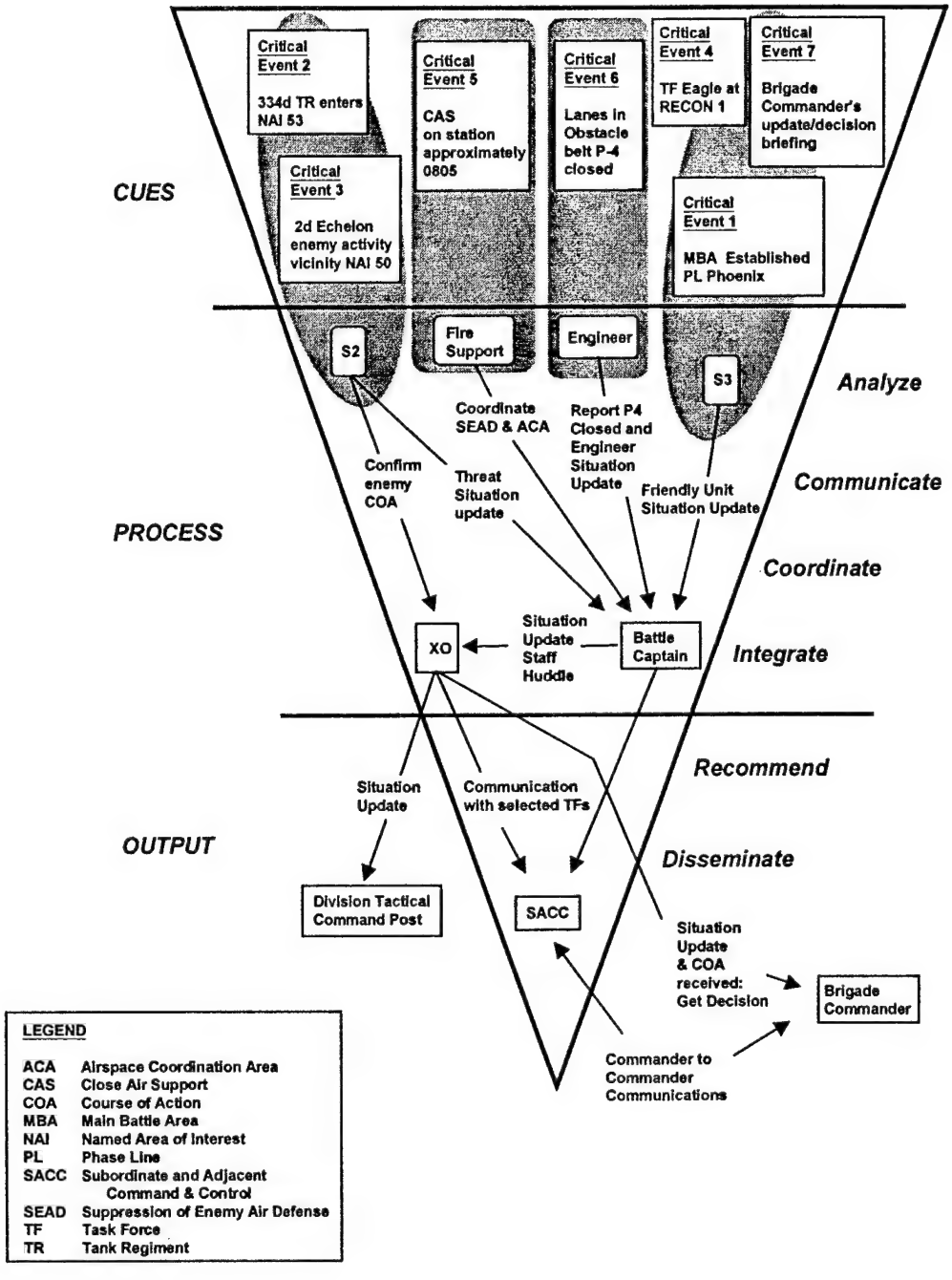


Figure 4. Example staff support process model ("mind map").

Use Scattergraph for Message Distribution [8d]

Providing a constant message flow to maintain the appropriate level of challenge within the exercise was an important concept for the current effort. The area defense mission was analyzed by breaking it down into five minute increments and reviewing each portion to determine the distribution of message traffic across all the brigade nets and to determine a measure of the brigade staff activity. Both the network and the recipient were annotated to ensure a logical, normalized, message flow and an even distribution of messages within the framework of the tactical situation. The Team's goal was to avoid overloading nets and personnel and to provide additional message traffic where gaps appeared, especially those that cued critical events. In addition, this allowed the Team to review and compare key message timing against total message flow, relative to staff activity, learning objectives, and required staff actions.

Develop Strength Charts and Overlays [10]

The Team initially used the set of charts in Field Circular (FC) 71-6 (Department of the Army, 1985) as a baseline to determine what information charts each staff section would maintain. The Team developed a combat vehicle strength chart that reflected companies and separate platoons. Upon developing the message traffic for each exercise, exercise authors prepared two charts for each staff section: the start of exercise (STARTEX) combat strength situation and the ENDEX combat strength situation for those units that each section was responsible for tracking. The beginning information was obtained by reviewing the Janus videotape and the message database up to the start of the exercise. The ENDEX charts were prepared by adjusting the STARTEX chart based on message traffic during the exercise. Where needed, messages were added to the exercise message database to reflect appropriate combat gains and losses. The development team then produced exercise graphics to include STARTEX and ENDEX friendly and enemy unit locations, status of friendly obstacle plan, and the status of R&S plan. The exercise author determined the appropriate information for each overlay and created the overlay for the workstation map display. Since brigades track company-level forces and higher, the charts were structured to reflect that level of interest.

After surveying several references and talking with a number of doctrinal subject matter experts (SMEs), the Team found that no standardized, doctrinal methodology for tracking friendly and enemy combat power existed. The method used by units tended to be tailored to individual preferences. After examining various examples of battle strength tracking presentation methods, including ATCCS 'pie-charts' or '18 wheelers', and, following experimentation with a number of different color and graphic combinations, the developers produced a hybrid version of a power chart that featured color-coding to allow the brigade staff to track friendly force vehicles, personnel, fuel, and ammo. The developer used a similar color-coding system for enemy forces, but organized the enemy BDA tracking to correspond with the likely tactical employment (e.g., forward security element, main body).

Develop Staff Section Preparation Materials [12a]

The SGT project's automated staff section preparation package evolved from earlier SGT work. With no standing O/C team for the current effort, the developers made staff section preparation a machine-delivered, mandatory process. This ensured that the staff sections completed all preparation activities. The process included a crosswalk of the exercise learning objectives and the applicable U.S. Army Training and Evaluation Program (ARTEP) MTP tasks, a review of the CCIR, DST, and staff synchronization matrix (with those critical portions highlighted), and a discussion of how staff success could be determined, in terms of the tactical situation and the learning objectives.

Develop Exercise Multimedia Preview [12b]

In the absence of a standing O/C team, an automated version of the pre-exercise briefing was created using Macromedia Director™. Based on the tactical materials, this multimedia preview provided a complete overview of the general tactical situation, as well as the selected exercise, and enhanced the immersion of the staff in the activities and actions to follow.

Feedback Material Development

Begin AAR Material Development [11]

At the same time as exercise material development was taking place, work on the structure and content of the AAR feedback materials was begun. Based on staff learning objectives, the creation of these materials was primarily concerned with reformatting and automation, applying the process previously designed for use by the O/C training team.

Develop Section and Exercise After Action Review Materials [11a, 11b]

With the exception of the staff transition table (which requires only the staff section AAR), all exercises require each staff section to participate in an individual staff section AAR and an exercise AAR, involving the entire training audience. The AAR presentation formats for the section and exercise AARs were developed to facilitate a self-administered "discovery" session using automated data. The automated AAR process requires the staff, both as individual sections and as a consolidated group, to conduct a thorough self-assessment by closely focusing on their use of the OPORDs products (specifically, the CCIR, DST, and staff synchronization matrix) and execution of the learning objectives.

Develop Required Print Material [6a]

Some exercise-specific training tools for the trainers and training staff are maintained electronically and printed on-site by the exercise administrator on the day of training execution. This saves the unit preparation time in gathering these materials from various sources, ensures all proper materials are available to appropriate trainers, and reduces the bulk of the Brigade Tables book. The development decision regarding which tools should be printed on-site was based on the requirement to provide only the tools that would most likely be available in a "real world"

situation. The Team determined which tools applied to each staff section or training support personnel. When the paper-based materials are printed on-site, they are automatically collated into packets appropriate for each user, as indicated in Table 8.

Table 8

On-Site Printed Tools

Training Material	User	
	Training Team	Staff in Training
Training team roster	✓	
AAR guidelines/outline	✓	
Exercise Director checklist	✓	
Interactor RFI guidelines	✓	
Exercise message list	✓	
Staff Support Process Model	✓	
STARTEX combat strength charts	✓	✓
Action Plan worksheet (XO)	✓	✓
Signal Operating Instructions Extract	✓	✓
Pre-Execution Staff Huddle Guidelines (XO)	✓	✓
Staff Synchronization Matrix	✓	✓
Decision Support Matrix	✓	✓

Support Requirements

To complete the TSP development it was necessary to specify the support requirements for the new SGT exercises. Unit participants for the current effort include a staff to be trained and a training team. The training team is composed of five or six unit personnel selected by the brigade commander to perform administrative, observer, and mentoring functions (see Table 5). If a brigade commander has additional personnel he wants to involve as members of the training team, they could perform mentoring functions according to their specific expertise (e.g., FS, EN).

To support brigade staff training for the main CP, a minimum of seven SGT workstations are required (see Figure 2). As mentioned previously, workstations are linked by a LAN so they can send and receive information to and from one another. Workstations are used as follows: four workstations are allocated for staff sections for each exercise, one workstation supports the exercise administrator with network status, one workstation controls the exercise and responds to staff-generated message traffic sent to higher HQ, and one workstation responds to staff-generated message traffic sent to subordinate and adjacent units. Personal computers are co-located with the Sun workstations for the S3, S2, FSE, and EN sections. They are used to conduct staff section preparation *before* execution, refer to tactical training aids *during* execution, and facilitate staff section AARs *after* execution. The SGT site also has a large-screen display that is networked to the workstations via the LAN. It is used *prior* to execution to show exercise previews, *during* execution as the SitMap, and *after* execution for the exercise AARs.

There are two printers located in the SGT area. One is in the CP area to emulate a unit fax machine. It handles all messages as outlined in tactical SOP going to mobile subscriber equipment. The other printer is near the interactor workstations. Its functions are to print exercise training materials prior to execution and to emulate higher and subordinate HQs' fax machines during execution.

The latter emulates the fax capabilities in a tactical CP. Reports that would come into a tactical CP are the same reports that will come off the fax during staff group training. During execution, appropriate staff will get a fax alert message on their workstation.

FORMATIVE EVALUATION: METHODS AND RESULTS

The purpose of formative evaluation was to monitor and track program execution, consistent with the program objectives. Specifically the SGT formative evaluation focused on the integration of theoretical constructs with off-the-shelf technology as applied to meet the staff training needs established in the needs assessment. It involved the following levels: internal review and testing, prototype review, a pilot test, and an implementation trial.

The FE team used the following methods to collect data: observer checklists, participant questionnaires (see Appendix C), and "hot washes" or group interviews for data collection. As the tactical tables were executed, designated members of the Team acted as observers and collected data on occurrences related to each of the component parts of the SGT exercise: exercise preview, staff section preparation, execution, section AAR, and exercise AAR. These data were augmented with participant questionnaires administered after each table (table specific) and a final questionnaire (which asked the individuals to rate the overall project). For the "hot washes" the participants were divided into three groups: (a) enlisted, (b) officer (less the command group), and (c) the command group (i.e., the S3, XO, and commander).

This chapter focuses on the results and suggestions from each of the three externally supported formative evaluation events—the prototype review, the pilot test, and the trial—which required non-SGT team members to review products or take part in the SGT training. The internal formative evaluation activities were discussed earlier in this report in the TSP Development Methodology Chapter.

Prototype Review

Description of the Event

The prototype review was conducted as a user panel; it required 24 hours over four days. The purpose of this review was for the participants to:

1. Identify problems related to the TSP.
2. Provide suggestions for revisions.
3. Comment on the usability and acceptability of the training program content.
4. Provide opinions on various concepts and approaches to the training not yet implemented in the prototype materials.

In most prototype reviews, the panel examines all phases and materials for a single exercise. However, in this project, which relied on the heavy use of technology to implement the training strategy, a linear approach was not cost effective. Instead, the panel reviewed the design concepts and prototypes of the materials that were to be developed for use on the computers and PDAs. Specifics are discussed in the paragraphs that follow. The purpose of this early look was to assure the Team that the development direction was the correct one and would meet the needs of the training audience.

The formative evaluation plan called for a prototype review by four military personnel. The requirements, as well as the ranks and qualifications of the review participants, are shown in Table 9. While only one active duty individual was provided, the experience level and expertise of all participants exceeded what was requested. The participants provided valuable, independent insights, since all had worked on other training projects and none were directly involved with the SGT project. Their input was gathered through a series of informal meetings and briefings, with an analysis based on application of the small group instruction methodology.

Table 9

Panel Members

Requirement	Participant
Lieutenant Colonel - Maneuver (Armor or Infantry)	Lieutenant Colonel – Infantry (Training Brigade XO)
Major - Military Intelligence (with a tactical intelligence specialty)	Lieutenant Colonel (Retired) - (Military Intelligence)
Major – Field Artillery	Brigadier General (Army National Guard) - Former Field Artillery Brigade Commander Colonel (Retired) – Field Artillery
Major - Engineer	Lieutenant Colonel (Retired) - Engineer (employed by contractor)

The following paragraphs summarize significant points made by the panel members during the prototype review. Those components of the SGT training system which are implemented on the computer—and therefore reviewed conceptually—have this fact noted in their title. A summary of the changes made to the TSP materials based on this process is found at the end of this subsection.

Pre-Exercise Material

Training Guide

The user panel expressed concern about the purpose and method of delivery of the Training Guide. The panel suggested that the information necessary for the commander and key unit members be put in electronic form for computer delivery.

Train-the-Trainer Program

The panel members saw a pressing need for a T^3 program. They expressed concern about how a unit would be able to conduct the program on their own. They saw the development of a successful T^3 program as a critical challenge for the developers.

Exercise Preparation Material

Exercise Preview (Computer Delivery During Training)

Panel members saw a prototype multimedia exercise preview that was created during the previous SGT effort and were given the script for the exercise they would be reviewing. The revised exercise preview was to have more enemy information, a review of the commander's CCIR, and a discussion of the next phase of the plan. The panel agreed that these changes were needed.

Section Preparation (Computer Delivery During Training)

The panel was provided with computer-based S2 staff section preparation material to review. The in-depth content review of this material was conducted by the military intelligence (MI) member of the panel. He provided additional information on intelligence asset feeds to be added and recommended that more information be included on the map concerning the enemy situation.

Pre-Exercise Staff Huddle

At this point in the development cycle the pre-exercise staff huddle was called a mini-rehearsal. The panel member discussion centered on the training staff's need to thoroughly understand the OPORD. Panel members stated that a staff rehearsal or OPORDs brief should be a requirement prior to conducting an exercise. They also suggested that structured guidance be provided to the unit on the intent of the pre-exercise staff huddle and how it should be conducted. These suggestions were incorporated into the TSP materials.

Exercise Execution Material

Message List (Computer Delivery During Training)

The FS and MI panel members made several suggestions to improve the message lists that were provided to them. This included more information on positioning and tracking of FA assets, and the inclusion of additional MI units to provide standard intelligence reporting.

Observer Checklist (Computer Delivery During Training)

The draft staff observer checklist was reviewed. The Team explained to the panel that the checklist would be placed on a PDA that would alert the observer when and what to look for, as well as provide a place to record observed behavior. The user panel voiced concern about the need for a back-up system if the PDA was non-operative. They stated that virtually anyone would be capable of being a staff observer using the PDA with the observer checklist and cues described. Without the PDA, the observer would have to be an experienced staff officer who was familiar with the exercise.

Coaching

The user panel felt that specific guidance on when and how much to coach should be provided to the observers. At this point in the development, specific coaching criteria had not been established. Based on this guidance, specific coaching questions were developed for each key message (e.g., reminders on the significance of reports; hints to cue specific activities). This encouraged the participants to correctly perform their staff actions.

Interactor Cell

The Team presented only the concept for the interactor cell. The panel members were concerned about whether a brigade would be able to find individuals capable of meeting the requirements of the interactor cell. They felt that the individuals in this cell would have to be highly qualified and thoroughly familiar with the exercise.

After Execution Feedback Material

For the after execution feedback material, the Team presented only the concepts since all these components were to be computer delivered and were still in development. For many of these ideas, the Team used the panel as a sounding board to assist in determining the actual structure of the feedback.

Section AAR (Computer Delivery During Training)

The user panel understood the concepts behind the "WOO" and the "staff fingerprint" but provided few comments or suggestions for these two tools. One concept presented by the Team was the idea of having each section rate the performance of the other sections in terms of learning objective performance on certain critical messages. The idea was for the sections to exchange this information in an attempt to look at how one section's performance impacted on the performance of other sections. The user panel voiced serious concerns about this, believing it would be interpreted as a "peer rating."

Exercise AAR (Computer Delivery During Training)

The user panel voiced concern about the amount of information the training team would have to process to prepare the exercise AAR and the time allocated to have the information processed and incorporated into the AAR.

Commander's Staff Training Profile (Computer Delivery During Training)

The user panel reinforced the views of the commanders interviewed in the needs assessment that the feedback had to be short, focused and timely. The user panel also expressed a concern that information contained in the profile might be used for unit evaluation reports.

TSP Modifications

The user panel's concerns, comments, and suggestions led to the following SGT team actions:

1. Revising the Training Guide. It was decided that the Training Guide would not be put in electronic form. If the SGT were to be fielded, the electronic format should be used; however, the funds available during this project were only adequate to electronically implement those components which directly contributed to the proof of principle of the small group training methodology.
2. Expanding the number and content of T^3 packages to include detailed directions for the commander, XO, exercise director, exercise administrator, workstation operators, interactors and observers. Additional job aids were developed to be printed before each individual exercise.
3. Developing new multimedia exercise previews more tightly linked to the learning objectives.
4. Establishing detailed coaching criteria and incorporating these into the PDA message sets to assist inexperienced observers.
5. Developing detailed observer checklists and coaching questions and installing them on the PDAs. Additionally, printed checklists were available from the electronic format (Microsoft Excel®).
6. Examining the staff section preparation material closely. The comments from the S-2 reviewer were incorporated into the material, and the time allocated in the training schedule to conduct the staff section preparation was expanded to 30 minutes.
7. Refining the exercise message based on the comments of the FS and the S2 review panel members.
8. Incorporating structured guidance on how to conduct a pre-exercise staff huddle in the T^3 and the pre-exercise print materials for the XO and commander.
9. Developing additional job aids for the interactors (e.g., ground truth overlays for every five minutes of battle).
10. Dropping any attempt to implement the rating of other sections during the staff section AAR.
11. Adding additional structure to the exercise AAR to streamline its implementation.

Pilot

An Army National Guard unit was the test unit and the training schedule was restructured to fit into a Multiple Unit Training Assembly 4 (MUTA 4) weekend. This meant that the evaluation of unit preparation materials had to be conducted at the unit's homestation prior to the pilot.

Formative Evaluation Instruments

The current SGT formative evaluation used techniques similar to previous SGT efforts (see Koger et al., 1998). However, the SGT participant questions for the current effort were all based

on a Likert-type scale. The scale ranged from -3 to +3. For questions dealing with effectiveness or appropriateness of the training, the scales were anchored by the terms extremely ineffective, neutral, and extremely effective. Far too easy, about right, or far too difficult were used when the questions dealt with the level of exercise difficulty. In all other cases the anchors used were definitely no, neutral, or definitely yes.

Evaluation of Unit Preparation Materials

This evaluation was accomplished at the unit's armory during a weekend drill. This was done approximately three weeks before the unit arrived for the pilot.

Tactical Orders

The tactical orders consisted of the OPORD for a brigade defense operation. The doctrinal accuracy of the OPORD had already been evaluated and approved during prior SGT efforts.

Workstation Operator Training/Familiarization

The unit had provided four individuals to go through the WST/familiarization at their home station. These individuals received the following instructions:

> Run through the contents until you are familiar with them. Note that underlined green words are hyperlinked, and that the pictures have text attached to them that will appear when the cursor turns into a little hand and you click on it.

With software mounted on unit computers and this limited oral instruction, three individuals had no difficulty going through the screens and worked independently through the material as it was designed. One individual, however, had never used a computer before, and had difficulty using the mouse.

Purpose of the Pilot

The purpose of the pilot was to evaluate the exercises and materials scheduled for use in the trial. There was only one exception—the commander's staff training profile. It was not used in the pilot because the software for this component was not yet ready. The pilot followed the schedule shown in Appendix E.

Pilot Results

The data collection effort covered many detailed aspects of the training project. At this point the major concern was to determine if the exercises and materials were effectively teaching the correct tasks. In addition, the Team wanted to ensure that the exercises were at a level of difficulty which was challenging enough to retain the interest of the training audience while not causing them to lose the self-confidence needed for success.

On Site Workstation Operator Training

While the officers reviewed the tactical OPORDs, the workstation operators completed 30 minutes of computer-based instruction (CBI). Upon completion of this training, the formative evaluation team administered questionnaires to the participants. The questions dealt with the effectiveness and appropriateness of the WST. All four operators rated the training positively. The two highest ratings were from the two operators who rated themselves as very proficient and knowledgeable on computers. All respondents felt they needed additional practice. Three of the four felt they needed 1 ½ to 2 hours of additional practice. The other individual felt he needed an additional ½ to 1 hour. This was the person who rated himself as the most computer proficient member of the group.

Level of Exercise Difficulty

The "crawl, walk, run" concept dictated that the exercise represent increasingly more complex learning, with no stage of training either so difficult that individuals felt overly challenged or so easy that they became bored. As a result, the exercises were restructured. To measure this dimension, the participant questionnaires administered after each of the exercises contained questions on the difficulty of the exercises conducted for both the individual and the staff section. The results are shown in Figure 5.

Challenge Dimension (Pilot)

	Transition Table*	Integration Table**	Command Post Table*
Individual Challenge	.36	1.18	.88
Section Challenge	.5	1.18	.72

*N=18

**N=14 (EN Section not included)

Figure 5. Mean participant ratings of exercise difficulty (scale range from -3 to +3) in the pilot.

It was the belief of the SGT team that the difficulty rating of the exercises should be in the positive—close to one (1)—to meet the design criteria and maintain the challenge level of the exercise. With the pilot participants, the means approached the intended difficulty levels. As was noted earlier in this section, the workstation operators, when surveyed before any training was conducted, felt that they required additional training to be proficient. The data collected from these individuals indicated that their concerns may have been premature; across the board they rated the exercises as less difficult than the group as a whole.

Focus of Staff Tasks and Learning Objectives

Qualitative and quantitative data indicated that the exercise kept the training audience focused on the SGT learning objectives rather than tactical outcomes, and met the staff training needs and deficiencies of the participant unit.

The individuals were asked to indicate on the participant questionnaires whether they thought that the correct staff tasks had been trained during each of the prototype exercises. The results of that question for each of the tables are shown in Figure 6. These results indicate that the participants felt strongly that the exercises were teaching them what they needed to know. Some of the comments made provided increased validity to these findings, such as "Geared toward what our staff needed," and "Oriented on appropriate tasks and (it) exercised the staff appropriately."

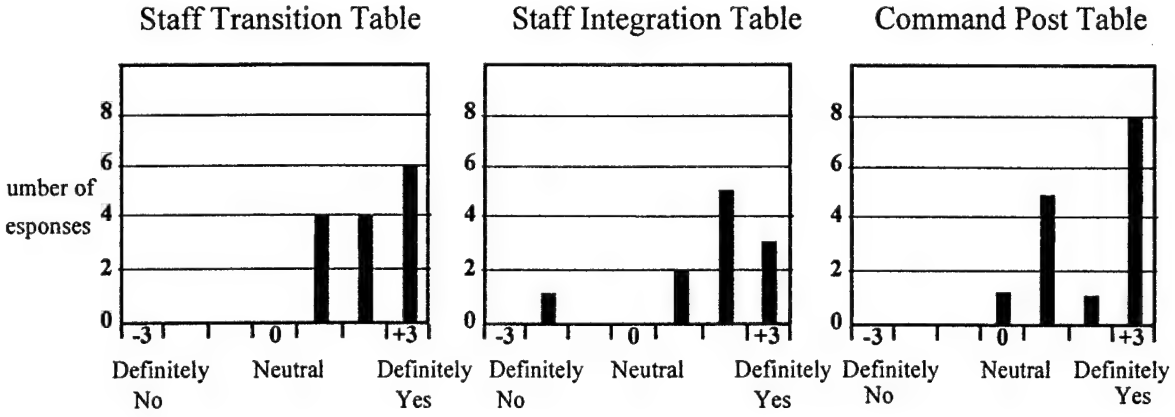


Figure 6. Frequency histograms for participant responses to the pilot question "Was the exercise focused on the correct tasks for your staff section?"

The participants were questioned directly on whether they felt that the objectives of the exercise had been met. The Team felt this was one of the most important factors to assess the validity of the small group methodology design concepts. The level of training of the various learning objectives was assessed using the participant questionnaires and the comments provided during the hot washes. The quantitative responses are shown in Figure 7. One of the comments from the hot washes was provided by a workstation operator who said " I don't know if it will improve the ability to perform the learning objectives, but it certainly gives us the knowledge we need to do it."

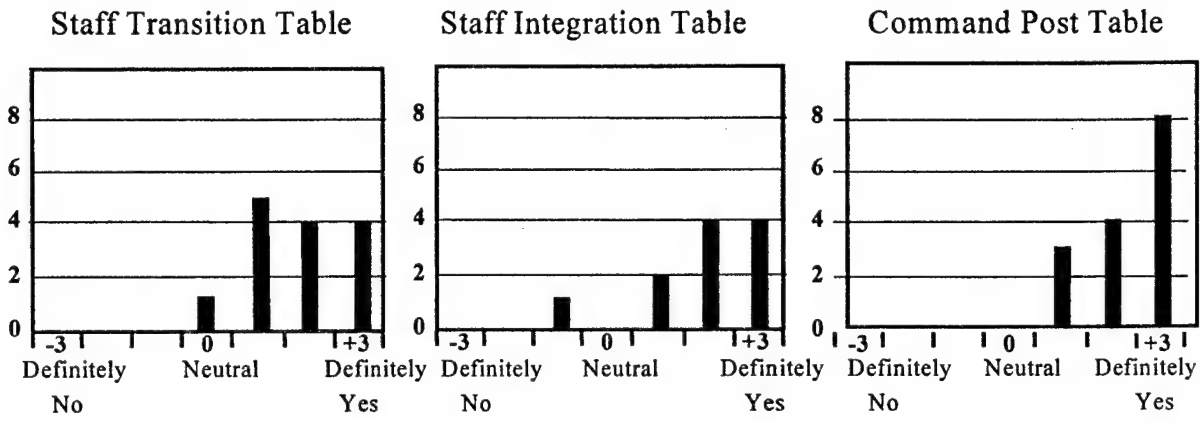


Figure 7. Frequency histograms for participant responses to the pilot question "Did the exercise achieve its objectives?"

Quality of Training Feedback

The results of the pilot test also indicated that the design of the structured AARs at both the section and the exercise level provided feedback that the staff felt was useful. It can be seen in Figure 8 that, overall, the ratings of the section AARs improved as the training progressed. The differences in the evaluation of the section AAR for the staff transition table and section AAR for the staff integration table may be due in some measure to command emphasis. The staff transition table hot wash results indicated that the personnel had given it less attention because the exercise was over. The individuals had taken approximately 10 minutes to conduct the section AAR and had not correctly filled in the self evaluation. The commander and XO were notified. When the unit returned to execute the staff integration table, they were informed by the XO that they were expected to properly complete the section AAR information and that he would be receiving this information. The later evaluations reflected this emphasis. Even comments reflected the change in attitude. After the CP exercise, one individual wrote "the staff (sic) AARs draw attention to mission critical areas."

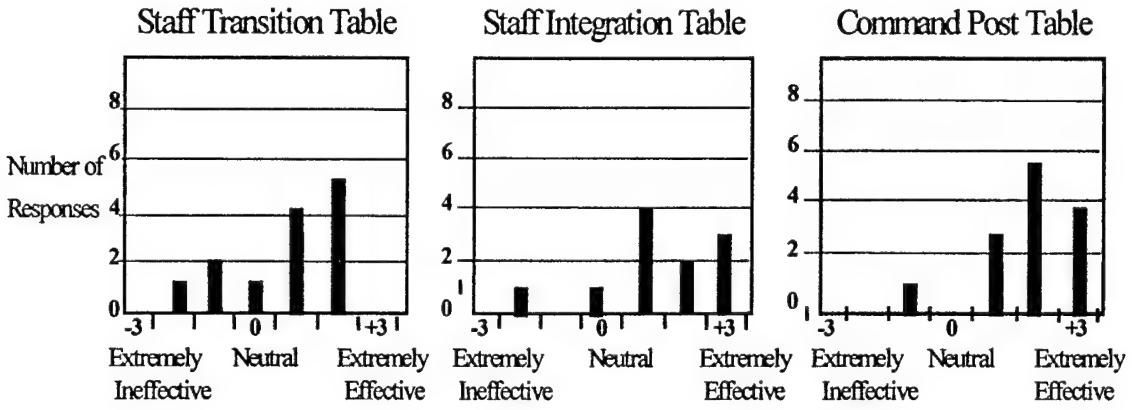
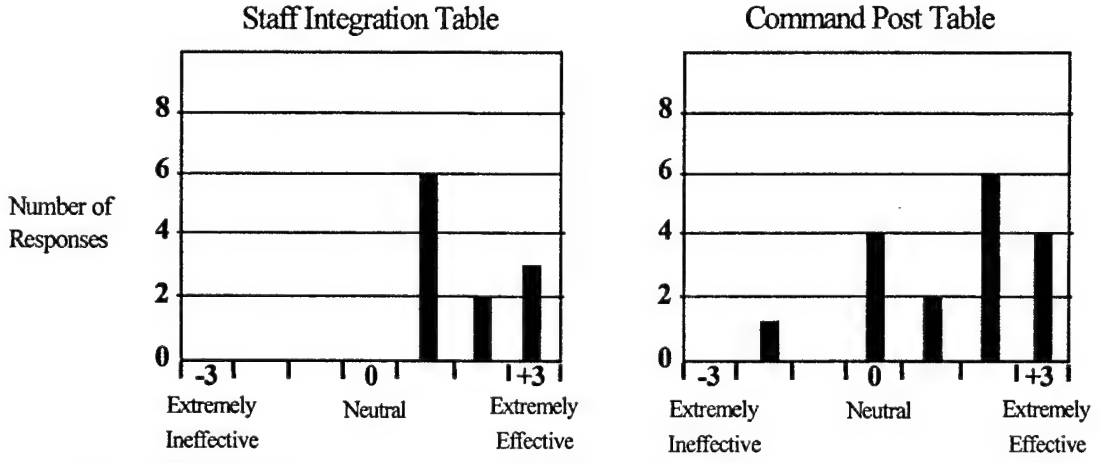


Figure 8. Frequency histograms for participant responses to the pilot question "How effective was the section AAR?"

The ratings for the exercise AAR (Figure 9) represent the training audience perceptions of the AAR effectiveness in two instances. The staff integration AAR was conducted by the SGT team, while the unit XO conducted the CP exercise AAR. In fact, the one -2 score for the CP exercise represents the XO's rating. He indicated in comments to the Team that the multimedia presentation was not streamlined enough to permit easy use by the briefer. The other participants did not seem to be aware of any problems. One participant stated that the CP exercise AAR was thorough and objective.



* The Staff Transition Table does not include an Exercise AAR

Figure 9. Frequency histograms for participant responses to the pilot question "How effective was the exercise AAR?"

Other Insights

The hot washes and the questionnaires provided other insights. The first finding was that the training exercises illuminated certain SOP deficiencies. It was also found that the interactor (higher and adjacent/subordinate HQ players) materials and procedures needed to be improved and that the number of messages needed to be increased in certain exercises and certain areas. Finally, observer checklists were difficult to use in tracking the learning goals of the exercises.

Trial

TSP Modifications

The purpose of the pilot was to identify changes needed prior to implementation of the trial. Thus, the following modifications were made in the TSP based on the results of the pilot:

1. The exercise AAR was redesigned and streamlined.
2. Messages for the FS, EN and S2 BOS areas were made more robust.
3. Interactor (higher and adjacent/subordinate) materials were improved by simplifying message traffic distribution and improving workstation overlay capabilities.
4. The software for the commander's Staff Training Profile was implemented.
5. Observer checklists were improved to allow easier tracking of learning objectives.

Homestation Preparation

The Team sent two members to the unit to present the same homestation training that had been provided to the pilot audience. However, since there was no drill weekend between the time the unit was identified and the execution of the trial, only a limited number of personnel were available. The Team members presented a limited group with the tactical OPORDs and installed the WST package on computers at the armory.

Conduct of the Trial

The training schedule was tailored to fit a MUTA 5 weekend. The trial was conducted very much like the pilot, with members of the SGT team acting in most of the principal trainer positions. The schedule for the trial is shown in Appendix E.

The unit arrived on a Friday evening with the brigade commander, XO and twelve staff members. That evening the unit participated in the tactical OPORDs review and the workstation familiarization similar to what the pilot unit had received at homestation.

Results

On Site Workstation Operator Training

The workstation operators completed a "homestation" familiarization on Friday evening. As with the pilot unit workstation operators, this group rated the training positively. In this group, the most proficient operator said he required no additional practice, while two others felt they

needed an additional ½ hour of practice. The final individual felt he needed an additional 1 ½ to 2 hours. It should be noted that the one individual who had difficulty was given additional help. This individual consistently felt that he had difficulty with the exercises and rated the difficulty of all the exercises as "far too hard." Several individuals commented that they would have liked to receive instruction 30 days before coming to the training.

Trial

The questionnaires were administered after each prototype exercise; however only two hot washes were conducted—one at the end of each day. It was felt by the Team that this would not cause significant problems with data collection because topics discussed during hot washes were often repetitive.

Level of exercise difficulty. As with the pilot, participants were asked to rate exercise difficulty. Results of this measure are in Figure 10. Once again, the means approached the intended difficulty level of 1. The rated difficulty of the exercises decreased as the unit progressed from table to table. One possible explanation for the decrease in difficulty ratings was that the participants may have gained proficiency on the system itself as training progressed.

Challenge Dimension (Trial)

	Transition Table	Integration Table	Command Post Table
Individual Challenge	1.29	.85	.79
Section Challenge	1.5	1.15	1.0

N=14

Figure 10. Mean participant ratings of exercise difficulty (scale range from -3 to +3) in the trial.

Focus on staff tasks and learning objectives. The trial audience, when questioned on the correctness of the staff tasks trained, responded as shown in Figure 11. These results again show the participants' belief that the correct staff tasks were being trained. One participant remarked that the exercise "definitely increased our awareness of what is required," while another cited the experience as a "great opportunity to develop staff interaction."

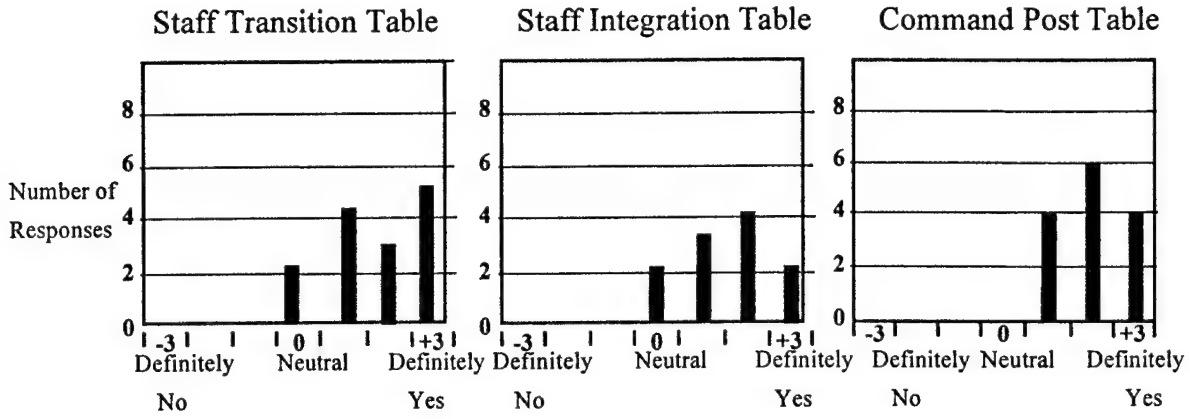


Figure 11. Frequency histograms for participant responses to the trial question "Was the exercise focused on the correct tasks for your staff section?"

As with the pilot participants, the trial participants were also questioned on whether they felt that the objectives of the exercise had been met. The responses are shown in Figure 12. Participants commented that the exercises "identified the 'internal message flow' importance for the TOC staff" and would be a "valuable tool to help increase unit readiness."

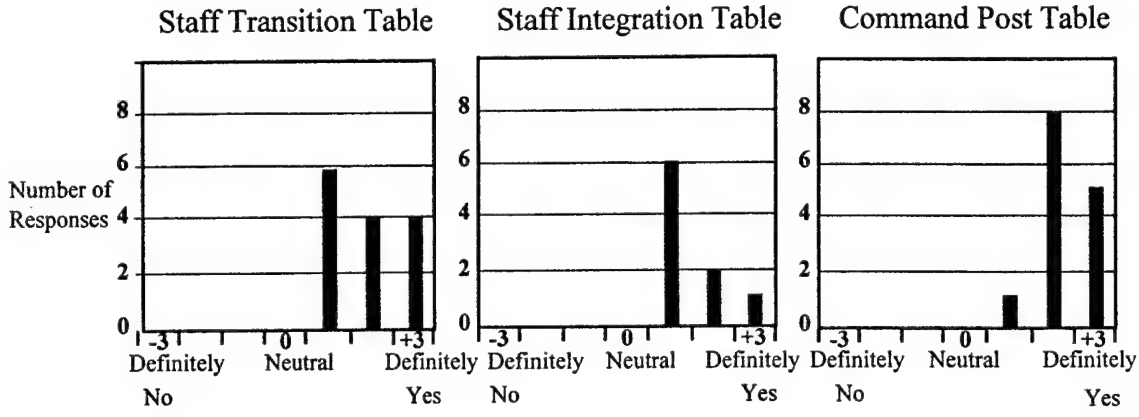


Figure 12. Frequency histograms for participant responses to the trial question "Did the exercise achieve its objectives?"

Quality of training feedback. The results of the trial indicated that the design of the structured AARs, both at the section and the exercise level, provided feedback that the staff felt was useful.

As with the pilot, the section AAR effectiveness ratings improved as the training progressed (see Figure 13). These AARs were often cited as an important aspect of the SGT system. Participants identified the AARs as being "an effective tool to bring together the big picture" and providing the opportunity to "allow us to think of better ways to gather information" in comments made on the questionnaires and during the hot washes. It should be noted when

considering the results shown in Figure 13 that more command group personnel were available to provide data for the staff transition table histogram.

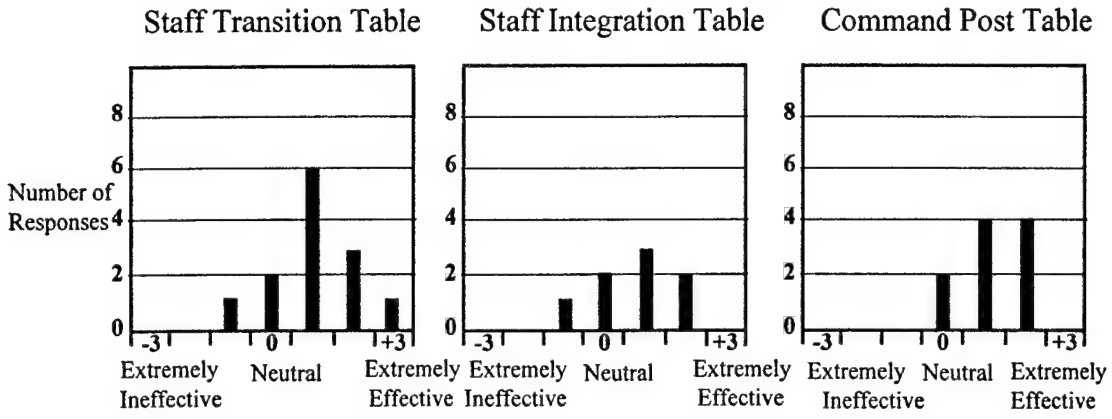
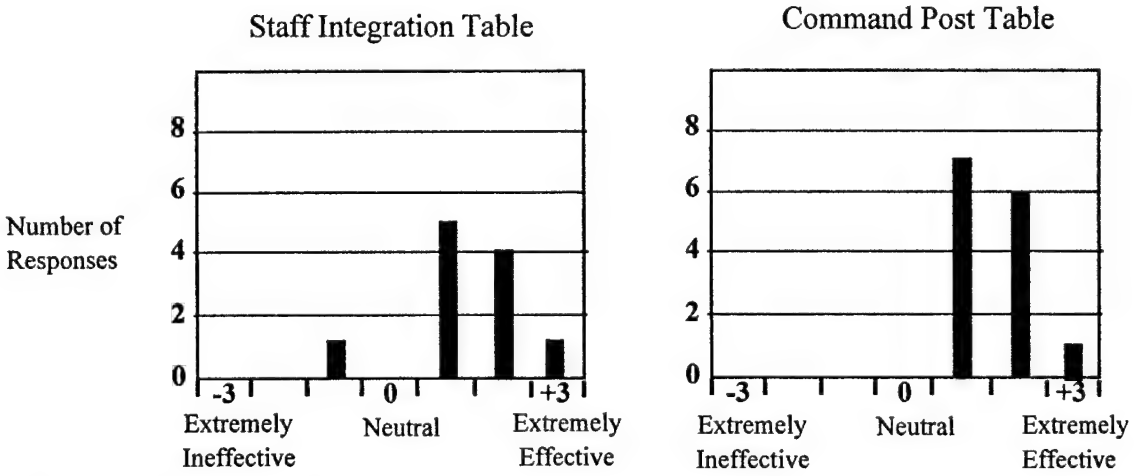


Figure 13. Frequency histograms for participant responses to the trial question "How effective was the section AAR?"

The histograms in Figure 14 represent the training audience perceptions of the exercise AAR effectiveness. The staff integration AAR was conducted by the SGT team, while the unit XO conducted the CP exercise AAR with directive comments made by the unit commander. The only negative score (-1) in AAR effectiveness came from the senior S2 analyst during the staff integration exercise. He indicated in comments to the SGT team that the exercise AAR took too long to complete, but he was otherwise satisfied with the exercise. Other comments indicated that the exercise AAR was very useful.



The Staff Transition Table does not include an Exercise AAR

Figure 14. Frequency histograms for participant responses to the trial question "How effective was the exercise AAR?"

Other insights. The hot washes and the questionnaires provided additional insights to the Team. Participants felt that the exercises pushed the staff to perform their duties correctly and in a timely fashion. They saw this as an opportunity to identify shortcomings in specific staff coordination areas, and to conduct staff integration and coordination training not provided elsewhere. Finally, participants remarked positively on the training system's capability to allow the staff to train without the involvement of other battalion or company level personnel.

LESSONS LEARNED

One of the more important aspects of this project is the documentation and discussion of lessons learned during the unfolding of the project—mainly those issues which had significant effects upon the final outcome and completion of products. The sections of this chapter are organized to follow the structure of the project: (a) Analysis, (b) Training Program Design, (c) Exercise Development, and (d) Project Evaluation.

Analysis

Needs Assessment

A key challenge during the previous SGT effort was determining the appropriateness of the difficulty level of training. The issue concerned the need for a crawl-level staff training program. The needs assessment made an important contribution to the current effort by confirming the requirement for crawl-level staff training. As a result, the focus of the training was at the correct level and on the correct objectives. Additionally, the unit's training and design constraints determined if the needs assessment matched. This meant that the unit saw this training program as something they could use.

Originally, the current effort did not call for a needs assessment but the pay-off was worthwhile. Future efforts like SGT should start with an up-to-date, accurate needs assessment. At a minimum, the needs assessment must identify the training focus, the target audience, and training constraints. It is a first and essential step for establishing a documented basis for thorough understanding of the training requirements. The results of the needs assessment imparted important aspects to the design.

Literature Review

As part of the front end analysis, a broad-based literature review was conducted. Adult learning, small group training, theoretical literature related to teams, and studies detailing innovative analytic approaches to assessment of performance were reviewed. This body of literature provided the researchers with new insights which were implemented as part of the design. This review of theoretical and applied literature provided a valuable source of support in both the design and development phases of the project and should be considered an integral part of any FEA.

Training Program Design

The SGT program was designed to follow the standard ISD methodology, with responsibility for products resting on a cooperative effort by the SME, the ISD specialist and the media specialist. The creation of a set of special worksheets, designed to provide a format for the development of component parts and to guide the structure of each exercise, proved to be an invaluable tool for accomplishing this effort. The worksheets enforced discipline of team members, requiring them to follow sound principles of adult learning in the application of the SGT training methodology (and providing a structure within which elements of the exercises

could be developed). Future developers should consider providing similar tools to guide the ISD portion of their development efforts.

The SGT team concentrated on filling a training need, using existing technology to run staff exercises. This approach allowed the Team to combine the latest research on team training, group dynamics, and adult learning with the use of off-the-shelf technology to fulfill the staff training requirement. The efficiency of this technique (in terms of manpower use and development cost) was recognized and should be pursued in future projects.

Exercise Development

Exercise Preview

A key concern for commanders was the current over-reliance on bulky, paper-based materials. The SGT TSPs converted paper-based, O/C delivered information to multimedia based, auto-instructional material. This approach provided units with the flexibility and ease of operation they needed to simplify their training. The automated preview reduced the knowledge requirements of O/Cs. It also implemented the principle of "immersion" into SGT training, shortening the time required to understand the training scenario while still ensuring a complete presentation of necessary background information every training iteration. A key lesson learned is that immersion is facilitated by multimedia previews that are accurate, concise, colorful, and mentally stimulating.

Staff Section Preparation

The design and development process for instructional media is described in various sources (e.g., Dick & Carey, 1985; Kemp, 1985). This process involves the integration of three different skills: (a) staff subject matter expertise, (b) ISD expertise (with experience on instructional development in the media being used), and (c) a trained media specialist. While it is possible for one person to have all three skills, the norm is for at least two people and usually three to be involved in this process. The SGT project used three individuals. The typical development procedure for the staff section preparation is for the exercise author—who was also the SME—to provide information to both the ISD specialist and the media specialist. The ISD specialist then would review the information and work with the media specialist who would develop the product (e.g., the staff section preparation program or exercise preview). The draft product would be returned to the exercise author who would review the material and explain any necessary changes to the ISD specialist and media specialist. The changes would then be made as appropriate. Not adhering to this process led to inefficiencies – and provided a reminder that use of the correct ISD process can prevent costly mistakes. Future projects that include development of computer-assisted training should have appropriately experienced personnel who are familiar with the ISD approach to training development.

Pre-Execution Staff Huddle

Confirming the commander's intent and understanding the "big picture" form an important part of troop leading procedures, especially within the context of the back briefing from the staff.

The staff huddle is a currently practiced (but often unrecorded) tried and true military procedure. The development of the pre-execution staff huddle T^3 materials provided the Team with the opportunity to examine the effectiveness of this technique in creating a shared mental model. It confirmed that this important procedure has value within simulation-based training systems and should be included in future efforts.

Exercise Execution

Subject matter experts. The SGT team discovered that they did not have the breadth of expertise necessary to fully develop BOS material for all the staff sections, especially the FS and intelligence sections. Trial and pilot participants in these staff sections assisted by making numerous suggestions for improving or adding message traffic to better perform their staff role. This enabled the Team to create detailed messages that more closely replicated real-time situations. A key lesson learned from the current effort is the importance of considering alternative sources of support to accommodate project requirements. This is a strategy likely to become even more commonplace given the constraints associated with the Army's current training resources.

Staff tools. During the trial, the staff officers indicated that a more complete set of internal staff tools should have been prepared with the OPORDs for use by the FS, EN, and intelligence sections. Staff sections reported that the standard job aids should be more detailed and focused on section-specific battle tasks. They reported that the synchronization matrix and DST tools were geared for the commander and maneuver elements (i.e., had a S3 slant). Developing additional staff tools for the intelligence, FS, and EN sections (primarily staff estimates used for preliminary OPORD work) would greatly increase the amount of material needed for support of an exercise. The lesson learned here is that the staffs may not have fully appreciated the tools available to them from the SGT. Rather than developing additional tools which may prove to be a training detractor, more emphasis should be placed on understanding and using the tools that are already provided. Furthermore, positive feedback regarding the power charts used for the exercise point to their potential utility and lead to the recommendation that they be put in electronic format so that they can be managed, tracked, and updated on the personal computer provided at each workstation.

Interactor cell. The ability to replicate all external nodes that a brigade staff might query during an exercise was an anticipated challenge, possible only with exercises that were highly structured and provided a general exercise tactical flow. The fact that the SGT is computer driven (providing the message list and all activities including movement, engagement times, locations, and results) contributed positively to maintaining exercise structure and supporting the interactor cell. The challenge was to provide all information the interactor cell would need in a manner they could use, and then train those interactors on both their functions and the use of the material. However, without dedicated BOS SMEs, the SGT team could not fully anticipate queries or provide the interactor with cell all of the full guidance. Once again, the need for SMEs for all BOS areas in the project was highlighted.

Staff Section After Action Review

The self-assessment technique implemented for the staff section AARs was similar to techniques recommended by Bailey et al. (1995) and Smith-Jentsch et al. (1996). This technique, both in SGT and in the shipboard team training environment, is dependent on a structured training exercise. The positive comments received during the pilot and trial indicated the value of this approach. Lessons learned from the current effort point to the importance of linking self-assessment to the learning objectives in order to improve staff performance. Likert scale ratings combined with written rationales of the ratings served as a useful mechanism for collecting self-assessment data on staff processes.

Exercise After Action Review

The exercise AAR provided staffs the opportunity to reexamine internal staff processes (i.e., SOPs) while the commander and/or XO reviewed learning objectives relevant to their particular staff (as opposed to an O/C facilitated session wherein there is the potential to severely limit the training audience's input, or to focus the discussion on topics other than execution of the learning objectives). Unexpectedly, the SGT exercises were used as a device during the pilot test to evaluate a unit's SOP. (As an example, the pilot unit discovered that their SOP contained no information on staff huddles.) The pilot audience adopted portions of the provided SOP to include in their own unit SOP. This illustrates the potential applicability of SGT components in assisting units with SOP development. The potential may be even more important to explore within the context of shared mental models and evolving TTPs for Force XXI.

Automation of Measurement

The SGT performance assessment design required the automatic collection of performance indicators by the computer data logger along with semi-automated data collected by the O/Cs. The WOO and staff fingerprint data was provided to staff sections upon completion of the exercise. With this information they assessed their own performance on the learning objectives. The automated measures in conjunction with the computer-driven staff section performance assessment permitted the SGT system to provide structured performance assessments oriented on learning objectives, without the use of O/Cs.

The semi-automated performance checklists completed by the O/Cs using PDAs provided additional performance data. This data, consolidated with the automated data and each individual sections' self-assessment responses, were provided to the commander. With this combination of quantitative and qualitative information, the commander could derive an action plan for future training. This was done within 30 minutes of the conclusion of the training, thereby creating an assessment package that was truly 'take-home.' The application of this technological approach increased information objectivity while improving timeliness of feedback.

The Team believes that future training projects should examine automated performance assessment to reduce operating overhead and provide unbiased data upon which the individual

trainees may assess their performance. The use of PDAs effectively reduced reliance on O/Cs, simplified the exercise observation process, and increased observational accuracy. The PDAs contained checklists cued to specific actions and times within the exercise, and alerted the observer as to who and what to observe. A key lesson learned is that automating the collection of data had high payoffs on a number of fronts (e.g., reduction in number of required observers, increased observational objectivity) and is an approach that should be adopted in future efforts.

Quality Control

Quality control was a challenge in the exercise development process. There is seldom adequate time or resources available for "total" quality control. However, when new software is developed even one small error can cause a system crash. The number of component part inconsistencies in SGT products was minimized once the Team instituted the use of development worksheets and insisted on strict adherence to a structured design methodology.

Quality control was an important aspect of developing the exercise driver for the current effort, the flow of messages (or message send stream). The exercise messages sent to each staff section replicated the messages they receive during an actual mission of the type being trained. The messages provided information from the division (higher), adjacent, subordinate, and supporting units. The automatically generated messages provided the training audience with all the information they should have needed to determine the actual "ground truth" situation. The quality of the section AAR depended on the accuracy and timeliness of the messages arriving at the staff section's workstation. For this to occur, a rigorous, time-consuming comparison of the actual message send stream had to be made against many separate components of the training system. Even with numerous reviews and adjustments prior to both the pilot and the trial, some errors went undetected. This highlighted the essential nature of the quality control process; every opportunity for review must be taken to ensure the delivered products are correct and to eliminate even subtle discrepancies. Time and resources to support thorough quality control should be a high priority of any effort and will provide valuable, long-term benefits.

Support Requirements

During the needs assessment, interviews with the commanders established that they would not have the training staff available to support simulation-based structured training as previously designed in SGT or in COBRAS. The previous SGT project used eight individuals for the evaluation of a brigade exercise (one exercise administrator, two interactors, one O/C for the XO and BC, and one O/C for each staff section evaluated in the Main CP). With COBRAS, a scaled-down brigade-level exercise (evaluating only the EN, FS, S2, and S3 sections) using BBS, O/Cs, and interactors would require at least 30 individuals (Campbell, Graves, Deter, & Quinkert, 1998).

The SGT pilot and trial were conducted using only four trainers. Two O/Cs observed the staff: the senior O/C observed the S3 section, BC, and XO; the junior O/C observed the FSE, S2, and EN sections. The reduction in personnel was made possible because interfaces for the exercise administrator and interactors were improved and simplified, and the O/Cs were provided

semi-automated data collection devices. The devices had signals to alert them to the actions they were to observe, and assist them in keeping their data observations synchronized with the exercise flow. Potential coaching questions were also provided on the data collection devices, reducing the background knowledge requirements of the O/Cs. Again, an important lesson learned surrounds the judicious use of technology to aid inexperienced or short-handed O/Cs. It may reduce the train-up time and provide a level of consistency across performance evaluations. In addition, it may also reduce the number of O/Cs required for an exercise, making the use of a particular training program more feasible for commanders.

Project Evaluation

Formative Evaluation Time Line

During the current effort, the Team generally followed the formative evaluation methods as planned. Certain portions were delayed or moved into later phases of development because technology innovations could not always be implemented as programmed. The portion of formal evaluation process requiring support external to the project staff was conducted late in the project. Delaying portions of the evaluation decreases the likelihood of incorporating the findings into the development effort and jeopardizes the contract delivery schedule. Thus, the evaluation should be conducted and revision recommendations provided early in the development cycle so that they can be used. Formative evaluation events should be spaced to permit time to implement revisions. However, if the time line does not permit revisions, sound formative evaluation records should be kept for use in any follow-on work

Formative Evaluation Methods

User Panel

The user panel was designed to be composed of active duty military members, representing the major BOSs of the brigade staff and the commander; however, only one position (the command representative) was filled with an active duty soldier. (Some part time assistance by another active military member was provided.) The BOS areas were reviewed by former military and reserve component members not part of the SGT team. The lack of active duty military assistance originally caused concern. Fortunately, the reviewers brought a wealth of knowledge (both tactical and training) to the project. While the Team would have preferred experienced experts from the active component as reviewers, the current effort demonstrated the utility of pursuing alternate sources of support. The Team also learned that coverage of each BOS area on the user panel was essential to ensuring a thorough accounting of all staff activities and requirements.

Hot Washes

As a part of the exercise evaluation process, participants in the pilot and trial were divided into three groups for the hot washes: (a) enlisted, (b) officer (not command group), and (c) command group. This separation proved to be beneficial as evidenced by the number and frankness of the comments that were received. The participants appeared to be comfortable in

providing detailed feedback on all aspects of the exercises, although the Team had to separate negative comments fueled by equipment unfamiliarity or resistance to changes in training approach from constructive feedback directed at the current effort.

Training Versus Data Collection

Not enough pilot/trial iterations were run to allow unit personnel to assume the observer roles. This was especially true for observer materials because these were not incorporated from prior work as were messages and exercises. Additional excursions and repetitions of the exercises (as a set) will be needed to capture a more complete picture of the efficacy of the materials; T^3 materials and touch screen interface require many detailed reviews to ensure verification of their utility, appropriateness, and effectiveness for the training audience.

The resourcing challenges in the Army today make it difficult to find units with the time and money needed to take part in a comprehensive evaluation of a new training system. The SGT team sought to provide the training audience with a good training experience while simultaneously evaluating the system and gathering insights. It is difficult to evaluate a system and provide unit training at the same time. Still, developers must be flexible and anticipate unexpected unit training requirements. For instance, lack of unit preparation time at homestation may require trainers to provide some additional instruction during the WST rather than allowing the individuals to proceed totally self-paced.

Participants

The participants for the pilot and trial were from intact brigade staffs, representing the target audience. These units were both from the ARNG. The fact that no active units were evaluated means that the system may need minor modifications to fit this training audience. While it is important that pilot and trial participants closely represent the audience for which the training is designed, it is also important that developers seek alternative sources of support when necessary. The ARNG provided a valuable alternative for the current effort.

CONCLUSIONS AND RECOMMENDATIONS

General

The current effort demonstrated that team process training can be implemented in a structured computer-driven learning environment. Development of such training requires a multi-disciplinary organization of SMEs, ISDs, formative evaluation experts, media designers, research psychologists, technology specialists, and software engineers. This team built a training framework to fit the user's needs with recognized small group training concepts, adult learning methodologies, and their understanding of the training requirements.

This TSP was designed to meet the brigade staff training needs for a system which would bridge the gap between individual training and interactive simulation based training. Interactive simulation training traditionally has high overhead. The Army needs a way to ensure the "most bang for the buck." Although not measured analytically, it would appear from the formative evaluation insights collected during this project that this TSP correctly fills the gap. More trials are needed to verify these findings. If fielding is to be considered, three steps are recommended:

1. The training packages must be converted to run on computers that have an operating system which is commercially available (e.g., Windows 95 or NT).
2. The complete exercise library should be developed in order to provide robust training.
3. All the T^3 materials should be computer driven packages.

In light of the overhead constraints normally placed upon military training programs, this can only be implemented if technology innovations are applied wherever possible. The SGT team did not attempt to fit the training to the technology, as frequently occurs. The probability of successfully implementing a training program that relies on technology is greatly improved by ensuring that the technology and software personnel clearly understand the training objectives.

The SGT team implemented many technology innovations. These were not done haphazardly. The Team examined requirements, constraints, and limitations. Potential approaches were linked to each requirement and the most cost effective approach which would satisfy the training requirement was selected. The contributions of the technology innovations are outlined in Appendix D. It is the opinion of the Team that the most important innovations were those which contributed to timely, process-oriented feedback and remediation and to low overhead. These training innovations were accomplished by using: (a) a computer-driven structured training delivery means, (b) an instrumentation package designed to collect performance information directly related to the learning objectives, (c) a time hacked, observer checklist linked to the learning objectives and running on an easy to operate PDA, (d) multimedia AARs covering each learning objective, and (e) highly structured T^3 packages.

As a result, a program like SGT could provide a staff training system with low overhead, quick, relevant feedback on performance, a training program which complements commanders' training goals, and an AAR cycle that is not totally dependent upon trained observers.

Recommendations for Further Research

The following list is based on this project's lessons learned and highlights areas for further research and development to meet unit commanders' needs.

1. Additional work should investigate the theoretical concepts used in this project, especially training on the "shared mental model" construct.
2. Further work is needed to ensure that the TSP meets active duty training requirements.
3. The implementation of computer-generated audio cues needs to be tested to see if this contributes to further staff improvements in performance.
4. Further work is needed to enhance the configuration and presentation of TSPs based on current multimedia and ISD research.
5. Investigations should be conducted on whether the additional C^2 exercises are required to fully prepare a staff for Janus or BBS.
6. Further work is required to investigate the connections between individual and staff group training programs, as well as between staff training programs and whole unit training systems.
7. Consider adapting SGT for current Army Tactical Command and Control Systems (ATCCS) application

The SGT project has pushed forward the frontiers of team process training. This work provides a solid, theoretically grounded foundation for future research. More research is needed to investigate the working of staff groups and the application of new technology to staff training needs.

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APPENDIX A
ACRONYMS AND ABBREVIATIONS

AAR	After Action Review
ADA	Air Defense Artillery
AR	Armor
ARI	U.S. Army Research Institute for the Behavioral and Social Sciences
ARNG	Army National Guard
ARTEP	Army Training and Evaluation Program
ATCCS	Army Tactical Command and Control System
BBS	Brigade/Battalion Battle Simulation
BC	Battle Captain
BDA	Battle Damage Assessment
BOS	Battlefield Operating System
BSTS	Battle Staff Training System
C/ST	Commander/Staff Trainer (currently called Staff Group Trainer)
C^2	Command and Control
CAS^3	Combined Arms and Services Staff School
CBI	Computer-based Instruction
CCIR	Commander's Critical Information Requirement
CGSC	Command and General Staff College
COA	Course of Action
COBRAS	Combined Arms Operations at Brigade Level, Realistically Achieved through Simulation
CP	Command Post
CTC	Combat Training Center

CVCC	Combat Vehicle Command and Control
DST	Decision Support Template
EN	Engineer
ENDEX	End of Exercise
FA	Field Artillery
FC	Field Circular
FEA	Front End Analysis
FRAGO	Fragmentary Order
FS	Fire Support
FSE	Fire Support Element
HACC	Higher and Adjacent Command and Control
HQ	Headquarters
IN	Infantry
ISD	Instructional Systems Design
ITTBBST	Innovative Tools and Techniques for Brigade and Below Staff Training
LAN	Local Area Network
LTC	Lieutenant Colonel
MAJ	Major
METT-T	Mission, Enemy, Terrain, Troops and Time Available
MI	Military Intelligence
MSG	Master Sergeant
MTC	Movement to Contact
MTP	Mission Training Plan
MUTA	Multiple Unit Training Assembly

NCO	Non-Commissioned Officer
NTC	National Training Center
O/C	Observer/Controller
OPORD	Operation Order
PDA	Personal Digital Assistant
POI	Program of Instruction
R&S	Reconnaissance and Surveillance
RFI	Request for Information
S1	Personnel
S2	Intelligence
S3	Operations
S4	Logistics
SACC	Subordinate and Adjacent Command and Control
SGM	Sergeant Major
SGT	Staff Group Trainer
SIMBART	Simulation-based Mounted Brigade Training Program
SIMNET	Simulation Networking
SIMUTA	Simulation-based Multiechelon Training Program for Armor Units
SitMap	Situation Map
SME	Subject Matter Expert
SOP	Standing Operating Procedure
STARTEX	Start of Exercise
T^3	Train-the-Trainer
TAC CP	Tactical Command Post

THP	Take Home Package
TOC	Tactical Operations Center
TRADOC	U.S. Army Training and Doctrine Command
TSP	Training Support Package
TTP	Tactics, Techniques, and Procedures
WOO	Window of Opportunity
WST	Workstation operator training
XO	Executive Officer

APPENDIX B
THEORETICAL CONSTRUCTS UNDERLYING THE STAFF GROUP TRAINER

Much of the foundation of the SGT project is based on a study of teams and how they accomplish their tasks. The application of this research to the current effort is discussed below.

Teams

A team consists of "two or more people with different tasks who work together adaptively to achieve specified and shared goals" (Brannick & Prince, 1997, p. 4). These authors state that teams have the following characteristics:

1. The team itself is not an ad hoc formation.
2. The team members generally have distinct functions.
3. The team tasks require simultaneity (multiple team members on same task) and sequencing (one team member's output is input to another team member), or both.

This information, along with the discussion of the interdependence of individuals on teams by Coovert, Craiger, and Cannon-Bowers (1995), was used by the Team to identify the brigade staff as a representation of a team. Those functions performed by the brigade staff (and by the individual staff sections) were examined in conjunction with the development of the SGT team processes.

Team Processes

A team process refers to "the behavioral, procedural, and temporal phenomena that describe a team's functioning" (Coovert et al., 1995, p. 151). These processes are dynamic and evolve over time. Training designers and developers must recognize and understand these processes in order to correctly design training which will train teams to perform effectively (Coovert et al., 1995). The processes must be identified for each training environment.

On the battlefield, the job or function of a military staff is to support the commander's decision making process. This decision making process was established in the previous SGT effort as the U.S. Army's commander's C^2 cycle with the sequential components of See, Assess, Decide, and Act (Department of the Army, 1995b). The staff procedures and behaviors that support this function are the foundation upon which this staff training system is designed. Each of these staff team processing components supports the commander's actions in some manner (ARI, 1997).

Research on team decision making in a military environment previously identified the behaviors of gathering, processing, integrating, and communicating information as important processes to support task-relevant decisions (Cannon-Bowers, Salas, & Converse, 1993). These researchers identified that team decision making required team members to process and filter raw data, apply individual expertise, communicate relevant information, and (often) make recommendations to other members. In a hierarchically structured team, such as a military staff, where final decision authority is retained by a single individual, the staff provides the decision

maker with assessments and information that are crucial to the situation (Cannon-Bowers et al., 1993). These behaviors were developed into a set of learning objectives for the previous SGT effort—monitor, process, analyze/evaluate, communicate, coordinate, integrate, recommend, disseminate, synchronize, and direct—and further refined for use in the current SGT.

Team Strategies and Teamwork

Team strategies consist of "a set of behaviors and interaction patterns initiated by the team in response to situational demands" (Coovert et al., 1995, p. 152). For the SGT project, the situational demands were created by and linked to tactical scenarios for the training exercises. This aligned the learning objectives of the exercises with the flow of the battle, creating the opportunity for successful performance of staff tasks. Teamwork has been defined as "the set of behaviors executed by two or more individuals as a function of coordinating requirements imposed by interdependent tasks in achieving common goals" (Brannick, Prince, Prince, & Salas, 1995, p. 642). Cannon-Bowers et al. (1993) saw teamwork skills as those skills which make individuals effective team members. The work of Cannon-Bowers et al. (1993) was very important to the current effort; the authors stressed the need for a highly structured training design implementation in order to build team effectiveness.

Shared Mental Models

The term "shared mental model" has been used for the organized knowledge shared by team members who work together over relatively long periods of time (Orasanu & Salas, 1993). Research has indicated that for a team to work well together, the team members must "develop a common understanding of the problem and a strategy for solving it. This includes an agreement about each member's role in the team and expectations about behavior" (Morgan & Bowers, 1995, p. 282). "Such knowledge enables each person to carry out his or her role in a timely and coordinated fashion, helping the team to function as a single unit with little negotiation of what to do and when to do it" (Orasanu & Salas, 1993, p. 7). U.S. Army doctrine has also established a basis for a staff's "shared mental model" (Department of the Army, 1988a; 1988b; 1988c; 1988d; 1992). Effective training must provide a method for team members to construct the common and necessary mental model of the problem circumstances (Rouse & Morris, 1986), and provide the cues for each team member which will lead to common interpretations of the events which take place (Cannon-Bowers, Salas, & Converse, 1993). For battle staff personnel this translates into a shared understanding of the events on the battlefield as they occur and a common placement of them into the context of the overall tactical mission.

The Team designed the training project so that leaders would specify the mental model to be shared. Research has shown that leaders of high-performing teams stated more plans, considered more options, provided more explanations, and sounded more warnings or predictions than low performing teams (Orasanu, 1990). The SGT training project's design concept was built on this research background and Army doctrine, and it formulated conditions to guide the staff in developing a shared mental model. The Team also established learning objectives that emphasized process-related goals (Jourdan, Bandura, & Banfield, 1991).

Adult Learning

Research in adult learning and staff training has indicated that learning is most effective if the instruction is designed to engender successful accomplishment as a part of the learning process (Jourdan et al., 1991). When first teaching a complex task, a learner's self-confidence beliefs and perception of success were enhanced by emphasizing process-related (learning) goals over outcome-related (performance) goals. Success was redefined to include effort, form, and strategy, rather than winning or losing or counting the number of tasks completed (Jourdan et al., 1991). Olmstead (1992) pointed out that other researchers (Mills, 1967; Gill, 1977) found that nothing contributed more to improved cohesiveness than a successful action. Druckman and Bjork (1994) wrote that by ensuring successful outcomes, individual self-confidence is built and this self-confidence is a potent predictor of future successful performance. Thus, one goal of the training project design was for the staff to be challenged but be able to achieve each exercise's training objectives successfully.

Training Design Philosophy

According to McIntyre and Salas (1995):

> Tactical teams within the military exist to (1) to help a leader assess a given scenario involving imminent danger or threat, (2) to provide information to the leader in a form that he or she can use in making a decision, and (3) to implement the action implied by the decision that the leader comes to. (p. 9)

This requires a trained staff. The staff members must be able to individually make decisions by processing system-specific knowledge as well as function as members of a team sharing individual knowledge and conclusions. They then must process pooled information into system-wide decisions (Druckman & Bjork, 1994). When taken in the context of training, the commander interacts with the staff as the "principal instructor" or "head trainer", establishing the goals and basic model to which all staff members must contribute their knowledge, expertise, and effort.

This effort is not the first to use these training precepts. The basic theoretical design for the research conducted in the current effort was taken from the Bailey et al. (1995) project guidelines for facilitating team training which included concepts for the development of: (a) training scenarios with event-based behavior triggers, (b) team performance measures, (c) use of a timely performance feedback system, and (d) trainer training on how to assess teamwork skills.

For their project, Bailey et al. (1995) developed tactical scenarios which had trigger events to cue individual task behaviors, as well as teamwork behaviors. In addition, other investigators such as Hall et al. (1993) state that it is very important to use highly structured scenarios which have been specifically designed to elicit appropriate decision making actions or critical team actions.

Bailey et al. (1995) also developed a measurement device which was used to capture information on situational awareness, communication, compensatory behavior, and team

leadership. The performance feedback materials consisted of integrated, automatically collected machine data, O/C data on effective and ineffective teamwork behaviors, and O/C ratings of team performance on a Likert scale with behavioral anchors. These dynamics were captured along the scenario event time line and debriefed within 15 minutes after the exercise concluded.

Bailey et al. (1995) went on to train the exercise observers on how to assess teamwork skills using a video tape of a previous exercise. They offered the following guidelines for designing rater (observer) training:

1. Familiarize raters with the critical trigger events within each scenario.
2. Provide information regarding scenario trigger events, and target task skills and teamwork behaviors.
3. Observe teams demonstrating effective and ineffective teamwork.
4. Practice identifying target behaviors and assigning ratings.
5. Provide feedback on the accuracy of the rater's assessments.

Debriefings were structured around the trigger events which facilitated preparation and helped focus on specific behaviors and actions. Bailey et al. (1995) found that developing a debriefing guide helped teams identify: (a) their strengths, (b) areas of opportunity for improvements, and (c) team goals to improve performance. Bailey et al. (1995) also found that soliciting team input as to why certain actions were taken or omitted helped to establish an interactive dialogue between team members and the debriefer.

APPENDIX C
SAMPLE OF SGT DATA COLLECTION INSTRUMENTS

Name: _____

Workstation Operator Training

Instructions: For the following questions, fill in the circle under the category that most closely matches your response.

1. How effective was the workstation operator training in getting you ready to be a workstation operator?	-3 Extremely Ineffective	-2	-1	0 Neutral	1	+2	+3 Extremely Effective
	O	O	O	O	O	O	O
2. Based on the workstation operator training, how sure are you that you could:	-3 Extremely Unsure	-2	-1	0 Neutral	1	+2	+3 Extremely Sure
create and post a map symbol to your section's map display ?	O	O	O	O	O	O	O
post the appropriate overlays to your section's map display?	O	O	O	O	O	O	O
post an overlay to the CP's Situation Display?	O	O	O	O	O	O	O
create messages using the appropriate message format?	O	O	O	O	O	O	O
send a message to the correct addressee?	O	O	O	O	O	O	O
3. In your opinion, in order to perform adequately as a workstation operator how much additional practice would you require?	0 None	0 to 1/2 hour	1/2 to 1 hours	1 to 1 1/2 hours	1 1/2 to 2 hours	2 to 3 hours	More than 3 hours
	O	O	O	O	O	O	O

4. What could be done to improve the Workstation Operator Training? Comments?

Continued on next page

Name: _____

Workstation Operator Training, Continued

What were the three strongest features of the Workstation Operator Training?
1.
2.
3.
☐ There were no strong features.

What were the three weakest features of the Workstation Operator Training?
1.
2.
3.
☐ There were no weak features.

Was there anything that must be changed before this Workstation Operator Training is useable?
1.
2.
3.
☐ There is nothing that needs to be changed for the Workstation Operator Training to be useable.

Exercise Evaluation Focus Group

Focus Group Organization

- Focus groups are organized to attempt to bring out as much information as possible in the short time provided.
- There are four focus as follows:
  - ⇒ Command Group
  - ⇒ Staff Officers
  - ⇒ Staff NCOs
- Each group is basically a peer group. This is done to encourage everyone to speak their mind and not look to the senior person.
- Each group has a slightly different perspective based on their roles in the training.

Ground work

- Ensure that everyone in the group knows the role the others in the group played in the last exercise.
- Ensure the group understands that your questions are focused on them--not the commander or anyone else. We are interested in what each member of the group has to say and his individual opinion.
- Our focus is on making this training better for each and every participant. Each of the participants entered the exercise with different levels of training and experience. Each of them had a different experience in the exercise and the training program. Therefore, each individual's views are coming from a slightly different experience and each is important.

Exercise Questions

1. What did you like best about the exercise?
(What has been most helpful to you?)
2. What did you like the least about the exercise?
(What was least helpful to you?)
3. What should be changed?
4. What should be continued just as it is now?
5. What should be continued but fine tuned?
6. What should be dropped?
7. What would it take to make this exercise more beneficial to you?
8. Do you have any other advice about the exercise?

Specific Questions for Each Segment of the Exercise

Questions	• The following are questions focused on each segment of an exercise. • These questions should be used in the final training program focus group.
Exercise Preview	• What did you think about the exercise preview? • The purpose of the preview was to quickly get you into the exercise. How effective was the preview in doing this? • What helped you the most? What helped you the least? Should anything be changed? Should anything be added? Dropped?
Staff Section Exercise Preparation	• Are there any new T&Ps that we are not using? • Were the power chart symbologies understandable/acceptable? • Was the material written at the correct level? • Were expected staff actions clear to you? • Did the self-assessment questions focus on what you needed to know to conduct the exercise?
Mini-Rehearsal	• How long should the mini-rehearsal be? • Should we put structure into the mini-rehearsal or leave allow more freedom to the XO/BC?
Execution	• How was the message traffic? Were there enough messages? Was the message traffic about what you would expect your section to receive? • Was your section able to keep the power charts current? Were there any difficulties? Was the message traffic sufficient for you to keep the power charts up to date? • Was the interactor cell responsive to you? • Besides voice and digital radio, and fax traffic, is there a feature that needs to be emulated that is not there now? • How did you section function as compared to normal operations? Were the interactions similar or different? Did your section learn anything about its interactions and how to improve them? Could you transfer what you learned about your interactions to normal operations? • Were you coached during the exercise? Was this coaching effective? Does the coaching needed to be changed or modified?

Continued on next page

Specific Questions for Each Segment of the Exercise, Continued

Staff Section AAR

- What did you think of the Section AAR?
- What were its strengths and weaknesses?
- Should anything be changed or refined in it?
- How effective was your Section AAR?
- Was the discussion focused on processes?
- Did the self-correction sessions focus on processes or outcomes?
- How good was your action plan?
- Were the instructions and tools adequate for your section to conduct its own section AAR?

Large Group AAR

- What did you think of the Large Group AAR?
- What were its strengths and weaknesses?
- Should anything be changed or refined in it?
- How effective was the Large Group AAR?
- Was the discussion focused on processes and how to improve those processes?
- Did the self-correction sessions focus on processes or outcomes?
- Were the right things discussed in the Large Group AAR?
- How good was your action plan?
- Do you think your unit could have conducted an effective Large Group AAR with the tools available?

Summary

Guides

1. Before the focus group, be sure you know the key questions and the approximate time the moderator plans to spend on each key question.
2. Be clear in your mind about the purpose of the focus group. The summary should tie closely to this purpose.
3. Take notes with two things in mind: first, notes that will help you provide a brief oral summary and, second, notes for your detailed analysis after the focus group.
4. Begin your oral summary with the most important findings, regardless of when they were discussed in the focus group. Don't worry about the question sequence when you construct your summary.
5. Begin your summary with findings--what was actually said. Attempt to capture common themes but also acknowledge differing points of view. This descriptive summary repeats what was said but is very brief. After you've given the summary of what was said, consider offering an interpretation. The interpretive summary attaches additional meaning and goes beyond the actual words.
6. Listen for what was not said but might have been expected. If these areas are important, then in the summary you might say, "Some things were not mentioned like . . . and I am assuming they are not important." Look at the participants while you're saying this and watch for reactions.
7. Cite key phrases used in the discussion. This demonstrates connectedness and careful listening.
8. Keep the summary to 3 minutes or less. If you ramble on, people will tune out.
9. When finished, look at the participants and ask, "Is this summary complete?" or "Does this sound OK to you?"

Responses to Questions

1. What did you like best about the exercise? (What has been most helpful to you?)	
Brief Summary/Key Points	**Notable Quotes**
Comments/Observations	

Continued on next page

Responses to Questions, Continued

2. What did you like the least about the exercise? (What was least helpful to you?)	
Brief Summary/Key Points	**Notable Quotes**
Comments/Observations	

Continued on next page

Responses to Questions, Continued

3. What should be changed?	
Brief Summary/Key Points	**Notable Quotes**
Comments/Observations	

Continued on next page

Responses to Questions, Continued

4. What should be continued just as it is now?	
Brief Summary/Key Points	**Notable Quotes**
Comments/Observations	

Continued on next page

Responses to Questions, Continued

5. What should be continued but fine tuned?	
Brief Summary/Key Points	**Notable Quotes**
Comments/Observations	

Continued on next page

6. What should be dropped?	
Brief Summary/Key Points	**Notable Quotes**
Comments/Observations	

Continued on next page

Responses to Questions, Continued

7. What would it take to make this exercise more beneficial to you?	
Brief Summary/Key Points	**Notable Quotes**
Comments/Observations	

Continued on next page

Responses to Questions, Continued

8. Do you have any other advice about the exercise?	
Brief Summary/Key Points	**Notable Quotes**
Comments/Observations	

Last Name: _____
Position: _____

Command Post (CP) Exercise

CP Exercise Purpose

The staff sections practice their intra- and inter-staff section communication and coordination skills. The command post builds upon previous experience to improve performance and teamwork in providing the commander and subordinate and higher headquarters information they need.

Role of the commander

The commander is the lead trainer for the Staff Group Trainer Program rather than a trainee. He trains his staff to:

- provide him information for his decisions,
- help him ***make*** his decisions,
- help him ***implement*** his decisions, and
- keep subordinate and higher headquarters informed.

This program is ***not*** designed to teach the staff tactics.

Questionnaire Organization

This questionnaire is organized into sections corresponding to the organization of the exercise. There are sections for the following phases:

- Exercise Preview
- Staff Preparation
- Mini-Rehearsal
- Exercise Execution
- Section AAR (SAAR)
- Staff (Large Group) AAR

There is also a section at the end for you to evaluate the entire exercise.

Importance of your response

Provide designers and developers with information needed to improve the exercise.

Instructions

- For the following questions, fill in the circle for the response that most closely matches your rating.
- Please provide your comments or suggestions in the comment block at the end of each section.

Exercise Preview

1. How effective was the preview in getting the staff ready to conduct the exercise?	-3 Extremely Ineffective	-2	-1	0 Neutral	+1	+2	+3 Extremely Effective
	O	O	O	O	O	O	O
2. Did you have a clear picture of:	-3 Extremely Unclear	-2	-1	0 Neutral	+1	+2	+3 Extremely Clear
What led up to this phase of the battle?	O	O	O	O	O	O	O
What the **commander expected** to happen in this phase of the battle?	O	O	O	O	O	O	O
What the **commander expected** from the **staff** for this phase of the battle?	O	O	O	O	O	O	O
3. How appropriate was the length of the Exercise Preview?	-3 Far Too Short	-2	-1	0 About Right	+1	+2	+3 Far Too Long
	O	O	O	O	O	O	O
4. What could be done to improve the Exercise Preview? Comments?							

Section Preparation

1. How effective was the section preparation in getting your section ready to conduct the exercise?	-3 Extremely Ineffective	-2	-1	0 Neutral	+1	+2	+3 Extremely Effective
	O	O	O	O	O	O	O
2. Did you have the information (locations and status of units, overlays, current battlefield situation, etc.) you needed to perform your tasks for this phase of the battle?	-3 Far Too Little	-2	-1	0 About Right	1	+2	+3 Far Too Much
	O	O	O	O	O	O	O
3. Did you have a clear picture of the battlefield situation for the start of the exercise?	-3 Extremely Unclear	-2	-1	0 Neutral	+1	+2	+3 Extremely Clear
	O	O	O	O	O	O	O
4. Did the DST and SYNCH MATRIX review give you a clear picture of what the commander expected during this phase of the battle?	-3 Extremely Unclear	-2	-1	0 Neutral	+1	+2	+3 Extremely Clear
	O	O	O	O	O	O	O
5. How appropriate was the length of the Staff Preview?	-3 Far Too Short	-2	-1	0 About Right	+1	+2	+3 Far Too Long
	O	O	O	O	O	O	O

6. What could be done to improve the Section Preparation? Comments?

Mini-Rehearsal

1. How effective was the Mini-Rehearsal in getting the staff ready to conduct the exercise?	-3 Extremely Ineffective	-2	-1	0 Neutral	+1	+2	+3 Extremely Effective
	O	O	O	O	O	O	O
2. Did you have a clear picture of what should occur according to the plan during the exercise?	-3 Extremely Unclear	-2	-1	0 Neutral	+1	+2	+3 Extremely Clear
	O	O	O	O	O	O	O
3. Did you have a clear picture of what the **commander and XO/BC expected** from your **section** during the exercise?	-3 Extremely Unclear	-2	-1	0 Neutral	+1	+2	+3 Extremely Clear
	O	O	O	O	O	O	O
4. How appropriate was the length of the Mini-Rehearsal?	-3 Far Too Short	-2	-1	0 About Right	+1	+2	+3 Far Too Long
	O	O	O	O	O	O	O

5. What could be done to improve the Mini-Rehearsal? Comments?

Exercise Execution

1. Did your section receive the message traffic you would have expected in this situation?	-3 Far Too Little	-2	-1	0 About Right	+1	+2	+3 Far Too Much
	O	O	O	O	O	O	O
2. Did your section receive the information you would have expected to receive in this situation?	-3 Far Too Little	-2	-1	0 About Right	+1	+2	+3 Far Too Much
	O	O	O	O	O	O	O
3. In this exercise you received only messages containing accurate information. If you were at the crawl level of proficiency this training is designed for, would you want to receive false or misleading information that would require you to evaluate each message's quality and accuracy?	-3 Definitely No	-2	-1	0 Neutral	+1	+2	+3 Definitely Yes
	O	O	O	O	O	O	O
4. Did your section have the tools (overlays, power charts, etc.) it needed for the exercise?	-3 Definitely No	-2	-1	0 Neutral	+1	+2	+3 Definitely Yes
	O	O	O	O	O	O	O
5. What could be done to improve the Exercise Execution? Comments?							

Section AAR (SAAR)

1. How effective was the SAAR material in guiding **your section's AAR**?	-3 Extremely Ineffective	-2	-1	0 Neutral	+1	+2	+3 Extremely Effective
	O	O	O	O	O	O	O
2. How complete was the SAAR materials for your staff section?	-3 Extremely Incomplete	-2	-1	0 Neutral	+1	+2	+3 Extremely Complete
	O	O	O	O	O	O	O
3. How effective was the SAAR in focusing the section's attention on improving the learning objective:	-3 Extremely Ineffective	-2	-1	0 Neutral	+1	+2	+3 Extremely Effective
monitor unit operations?	O	O	O	O	O	O	O
process information and messages?	O	O	O	O	O	O	O
analyze information?	O	O	O	O	O	O	O
communicate mission critical information?	O	O	O	O	O	O	O
coordinate information and intelligence?	O	O	O	O	O	O	O
integrate staff input?	O	O	O	O	O	O	O
recommend a course of action?	O	O	O	O	O	O	O
disseminate the commander's decision?	O	O	O	O	O	O	O

4. What else was needed? Comments?

Large Group AAR

1. How effective was the Large Group AAR material in guiding your AAR?	-3 Extremely Ineffective	-2	-1	0 Neutral	+1	+2	+3 Extremely Effective
	O	O	O	O	O	O	O
2. How complete was the Large Group AAR materials for your staff?	-3 Extremely incomplete	-2	-1	0 Neutral	+1	+2	+3 Extremely Complete
	O	O	O	O	O	O	O
3. How effective was the Large Group AAR in focusing your staff's attention on improving their performance on the learning objective:	-3 Extremely Ineffective	-2	-1	0 Neutral	+1	+2	+3 Extremely Effective
analyze information?	O	O	O	O	O	O	O
communicate mission critical information?	O	O	O	O	O	O	O
coordinate information and intelligence?	O	O	O	O	O	O	O
integrate staff input?	O	O	O	O	O	O	O
recommend a course of action?	O	O	O	O	O	O	O
disseminate the commander's decision?	O	O	O	O	O	O	O

4. What could be done to improve the Large Group AAR? Comments?

Exercise Evaluation

1. Did the exercise achieve its objectives?	-3 Definitely No	-2	-1	0 Neutral	+1	+2	+3 Definitely Yes
	O	O	O	O	O	O	O
2. In your opinion, how effective was the exercise?	-3 Extremely Ineffective	-2	-1	0 Neutral	+1	+2	+3 Extremely Effective
	O	O	O	O	O	O	O
3. Was the exercise focused on the correct tasks for **your staff section**?	-3 Definitely No	-2	-1	0 Neutral	+1	+2	+3 Definitely Yes
	O	O	O	O	O	O	O
4. Was the exercise focused on the correct tasks for a **maneuver brigade staff**?	-3 Definitely No	-2	-1	0 Neutral	+1	+2	+3 Definitely Yes
	O	O	O	O	O	O	O
5. Did the exercise present a sufficiently challenging experience for **you**?	-3 Far Too Easy	-2	-1	0 Neutral	+1	+2	+3 Far Too Hard
	O	O	O	O	O	O	O
6. Did the exercise present a sufficiently challenging experience for **your staff section**?	-3 Far Too Easy	-2	-1	0 Neutral	+1	+2	+3 Far Too Hard
	O	O	O	O	O	O	O
7. Did the exercise present a sufficiently challenging experience for the **brigade staff**?	-3 Far Too Easy	-2	-1	0 Neutral	+1	+2	+3 Far Too Hard
	O	O	O	O	O	O	O
8. Comments:							

9. Did the exercise improve **your section's** ability to perform the learning objective:	-3 Definitely No	-2	-1	0 Neutral	+1	+2	+3 Definitely Yes
monitor unit operations?	O	O	O	O	O	O	O
process information and messages?	O	O	O	O	O	O	O
analyze information?	O	O	O	O	O	O	O
communicate mission critical information?	O	O	O	O	O	O	O

10. Did the exercise improve **your staff's** ability to perform the learning objective:	-3 Definitely No	-2	-1	0 Neutral	+1	+2	+3 Definitely Yes
coordinate information and intelligence?	O	O	O	O	O	O	O
integrate staff input?	O	O	O	O	O	O	O
recommend a course of action?	O	O	O	O	O	O	O
disseminate the commander's decision?	O	O	O	O	O	O	O

11. What else was needed? Comments?

What were the three strongest features of the exercise?
1.
2.
3.
☐ There were no strong features.

What were the three weakest features of the exercise?
1.
2.
3.
☐ There were no weak features.

Was there anything that must be changed before this exercise is useable?
1.
2.
3.
☐ There is nothing that needs to be changed for the exercise to be useable.

APPENDIX D
KEY TECHNOLOGY INNOVATIONS AND DEVELOPMENT

This effort focused on improving and refining the system developed for SGT. During the previous SGT, "technology" was synonymous with the software code originally written for the CVCC project that ran on the Sun® system. The refinements called for in the current effort required a broader definition of "technology." This project refined the custom C code for the Sun platforms that was developed under the previous SGT effort but applied many additional technology innovations to meet the needs of the users. Intel® based PCs were added to assist in staff section preparations, WST, the display of training aids during exercise execution and the staff section AAR. These applications used MS Visual Basic 5® and MS® Help code for the computers running the Windows95® Operating System. The Newton 2000® PDAs with Quick Figure spreadsheets were incorporated to assist observers, and finally the exercise preview and the exercise AAR were developed using the multimedia program Macromedia Director®.

Methodology

The initial list of technology modifications was developed during the design phase of the project and was based on the following: (a) shortcomings in the system which emerged during the previous SGT formative evaluation, (b) system features that had not been developed earlier even though they were on the list of desired software, and (c) solutions needed if the training materials were to be modified in accordance with the commanders' needs. The nine learning objectives and the small group training methodology were used to evaluate whether the technology solutions would be implemented. If the technology provided no training contributions, then it was not implemented.

As each technology innovation was implemented, the project development team ran tests to see if expected performance standards were being met and if the innovation appeared to contribute positively to the training environment. If no problems were encountered during this stand-alone trial, the development team integrated and tested the innovation in a full training environment. During the external formative evaluation events, training audience problems or concerns were recorded. These were reviewed by the Team for potential modifications or additions.

Key Technology Innovations

The SGT Team organized the potential technology solution implementation process into several areas:

1. Technology changes that would simplify system operating capabilities or improve instrumented data collection.
2. Modifications that would simplify the job of the exercise administrator.
3. Tools that would facilitate training for trainees, interactors, and observers.
4. Technology changes to support the development of computerized TSP components.

System Operations and Instrumentation Data Collection Capabilities

Simplified File Structure

The most significant change made in this area involved the simplification of the network file structures to a system more similar to a client/server. Under the previous version of SGT each of the computers mounted the file systems of all the other systems (a peer/peer system). This meant that in a TOC setup with four player workstations, each loaded itself and the other three positions. This approach made it extremely difficult to operate the system if one computer failed to boot. It was also an inefficient use of disk space. The modification changed the file structures so that all of the workstations mounted from a single hard drive external to all the systems.

Impacts of the change. There were several improvements resulting from the simplified file structure.

1. It is now no longer necessary to boot up the machines in a rigid order or even boot up all the machines.
2. It is easy to reconfigure the system and add in new player positions. This facilitates ease of operations for both training and development.
3. The developers have quick access to files used on the workstations and can troubleshoot modifications.

Recommended improvement. The network protocols should also be updated. This would facilitate the migration of the SGT to a different host platform.

Improved Data Collection

The previous SGT had instrumentation files which tracked certain actions that occurred at a workstation, such as when a message arrived at a workstation, when it was opened, when a new message was composed, and when a message was sent. With the increased integration of the learning objectives into all the dimensions of the training project it was also necessary to collect data on the actions which could measure behavior associated with the learning objectives *analysis* and *communicate*. The capability to record when overlays were updated at the workstations (analysis) and when they were sent to the TOC map display (communication) was therefore added.

Impact of the change. The extended instrumentation permitted the Team to improve the section AAR graphic feedback (staff fingerprint and WOO) to the staff sections. This was done by linking their performance to more complex learning objective dimensions.

Recommended improvements. The present instrumentation will only collect data if the action is performed using a certain procedure; thus if a trainee develops a way to do something more efficiently, the machine may not record this performance. Modifications could ensure that no matter how the operation was performed only the result would be recorded.

Exercise Administration Functions

Exercise Administrator Workstation Graphic User Interface

In the prior SGT project, it was necessary to spend an entire day training the exercise administrator. Furthermore, the individual had to have a good understanding of computer file structures and some experience with UNIX commands prior to the training. If this individual accidentally made a mistake when typing an entry, it was possible to render the system non-operational until the software could be reinstalled. The new exercise administrator interface has simplified the system by implementing a graphic user interface. Only one UNIX command is needed to launch the system. After that the exercise administrator can choose to: (a) select the exercise vignette, (b) load the vignette, (c) start all workstations, (d) reset, pause and resume the game clock, or (e) recover crashed workstations.

Impacts of the change. The improved workstation graphic user interface resulted in several benefits.

1. It decreased training preparation time and made the system so simple to use that many more unit personnel can meet the requirements necessary to function as an exercise administrator.
2. It reduced the chances that the exercise administrator will cause a system crash during an exercise.

Recommended improvements. The designers should incorporate a touch screen interface and remove the keyboard and mouse from the terminal. This would speed exercise administrator actions and minimize the possibility that the trainer could accidentally crash the system. Without a keyboard or mouse, it would not be possible to make UNIX command line entries.

System Support for Trainees, Interactors, and Observers

Point of Training Exercise Support Materials

Previous simulation training found that trainees were often unable to find the correct training materials for a given exercise (due to the excessive size of the TSP documentation), or had failed to bring the correct documents. This led to decreased training effectiveness. This effort remedied the problem with the development of "point of training" exercise materials printed on location. With a click of the mouse on a labeled desktop icon, a custom Visual Basic 5® program running on a Windows 95® based personal computer executed an exercise unique print program. All mandatory materials were produced, neatly labeled and collated for use.

Impacts of the change. This change provides several benefits.

1. All individuals participating in the training — trainees, observers, interactors, and trainers — were provided with the printed information essential for the successful accomplishment of exercises.

2. This would reduce the amount of materials stored by the unit and minimize the possibility that essential training materials would be lost.

Recommended improvements. None.

Simplified Map Commands

The map for the previous SGT effort was so difficult to use that operations which should have been conducted by the sections were not done. The workstation operators could not figure how to accomplish this during the one hour exercise. Some of the most serious shortcomings with the earlier system and the SGT remedies for those shortcomings are shown in Table D1.

Table D1

Map Command Shortcomings and Associated Improvements

Initial Shortcomings	Improvements
Poorly structured menus caused confusion.	Restructured menus more closely match military concepts of map/overlay operations.
Drawing map icons was difficult and time consuming.	Library of commonly used unit icons developed. These unit icons were placed on the desktop and could be used by simply dragging and dropping. The set of library icons displayed at each workstation represented those icons most commonly used by that section (i.e., EN - mines symbols, FSE - artillery units). Any symbols or icons developed by the training participants were added to the desktop for use again at any time during the exercise.
A section could edit any overlay and send it to the TOC SIT DISPLAY (e.g., EN could edit S-2 overlay and send to TOC SIT DISPLAY).	Overlay ownership was established at each workstation. All the workstations could view any overlay; however, each section could modify only their own overlays.
Message icons were sent straight to the SIT DISPLAY without analysis, causing that display to become cluttered since removing them was done infrequently or never.	Message icons, if sent to the SIT DISPLAY, blink to draw attention to the update but cease to display after 90 seconds. If they are important they must be added to the section overlay and that overlay is used to update the SIT DISPLAY.
Workstation operator had difficulty knowing when he was entering and/or leaving the MAP Edit mode.	Overlays belonging to a workstation (i.e., those which can be modified) are always in edit mode. All other overlays can only be viewed.
100 km X 100 km map size limited ability of the brigade staff to track division operations.	Size increased to 200 km X 200 km.

Impacts of the changes. The simplified map commands resulted in improved operations.

1. Workstation operators required less time to become proficient with map editing.
2. Fewer errors were made with the map overlays.
3. The technology became less of a training distracter.

Recommended improvements. There were two recommended improvements that could be made.

1. Add an 8x power zoom (in and out) for viewing the map. This would help the training audience scale the map more efficiently.
2. Develop "help wizards" to do map editing tasks.

Automated Observer Checklists and Coaching Questions

In the previous SGT project, there was one observer for each workstation. These were trained, standing O/C team observers. They received printed checklists and coaching questions linked to the critical messages to be sent by the system during the exercise. During the pilots and the trials some of the observers used the checklists and coaching questions while others did not. One complaint concerned tracking the game time. If the observer lost track of the game time, coaching opportunities were either late or missed completely. This project was designed to have two untrained observers in the main CP to observe the BC/XO and the four staff sections. Successful execution of training required that these observers have tools which would structure their observations in much the same manner as the structured message traffic ensured that the training audience was exposed to the timely and correct tactical trigger events. The team programmed PDAs with checklists that were time sequenced and asked questions about staff actions which could be observed directly and answered with a "1" for observed and left blank if not observed. These observations were related to either the timeliness or the accuracy of a specific learning objective. Coaching questions and directions on who to monitor and what should be going on appeared on the screen, synchronized with the game clock and the message stream.

Impacts of the change. This change had several beneficial results.

1. The automation of the checklist along with alarms and coaching questions permitted successful, effective observation by less experienced personnel.
2. The data collected on the PDAs was immediately available to the commander on-site. He could use this data to evaluate what had just occurred in a given section during the exercise while the staff sections conducted their section AAR and self-assessment.

Recommended improvements. None.

Interactor Workstation Improvements

During the previous SGT effort, the Team observed that the interactor positions were manned by personnel who used the mouse and keyboard with some difficulty. These individuals were handicapped in providing the necessary responses to an RFI coming from the training audience. Several improvements were made in the white cell workstations which improved the speed and accuracy with which they could react. Touch screens were added to the message display screen. Entries that were selected from the pull down menus could be done with a mouse click. In addition, private overlays were established for the Higher and Adjacent Command and Control (HACC) and Subordinate and Adjacent Command and Control (SACC). The trainees could not post these overlays, but they permitted the HACC and SACC to see the current ground truth overlay every five minutes during the exercise.

Impact of the change. The enhanced workstations improved white cell responsiveness.

Recommended improvements. The design should require that the interactors participate in a WST session tailored for white cell operations.

Train-the-Trainer Materials

In the prior SGT, all of the T^3 materials were printed. In an effort to meet the demands of the commanders to make the SGT exportable and easily trained, the Team developed a workstation operator tutorial using MS Help®. This application operated exactly like the help packages associated with Microsoft Office 95®; however, it was customized to contain information on how to perform the operations necessary to serve as a workstation operator during an exercise.

Impact of the change. On-site workstation training was cut from four hours to 30 minutes.

Recommended improvements. One improvement would be to place all other T^3 packages in MS Help® custom applications and eliminate printed materials.

Structured Section AARs

This SGT effort resulted in two different types of AARs. The first one—the section AAR—was designed to run in Windows 95® and was written in Visual Basic 5®. The section AAR used information collected by the computer instrumentation package and presented it graphically to the section, along with a set of self-assessment questions. These questions focused on staff section performance in response to specific critical event triggers. When completed, the section was provided a printed copy of the ratings they gave themselves, the rationale for the rating, and, if the ratings were substandard, a list of remediation sources.

Impact of the change. The section self-assessments had positive impacts on the section AAR.

1. This information permitted the section to evaluate their own performance on each of the key critical specific performance measures.
2. The section AAR could be conducted with no assistance from an observer.

Recommended improvements. The design should improve the content of the remediation data printed by expanding to a complete paragraph instead of a single line citing a reference.

TSP Development Tools

Exercise Development Tools

Improvements have been made to one of the programs developed during the previous effort to make message input simpler, more rapid, and more accurate. (Message input changes can now be done with a simple edit menu instead of using the UNIX VI text editor.) With this new tool,

most of the files needed to change exercises can be created or updated with ease. The tool uses a graphic user interface (and pull down menus in places where limited input is required) to ensure that new or modified files will be in the correct format.

Impact of the change. Exercises can be quickly developed or modified as needed with minimal effort or manpower.

Recommended improvements. Develop a tool system that simplifies the development of exercise overlays.

APPENDIX E
PILOT AND TRIAL SCHEDULES

Table E1

Pilot schedule

Day/Time	Event	Audience
Saturday		
0900-0930	Orientation	All
0930-1000	OPORDs Review/Workstation Operators Training	All
1000-1300	Execute Staff Transition Table	All
1300-1330	*Lunch*	All
1330-1430	Table Hot Wash	All
1430-1830	Execute Staff Integration Table	All
1830-1930	Table Hot Wash	All
Sunday		
0700-1200	Execute Command Post Table	All*
1200-1330	Table and Program Hot Wash	All

*Note: The EN staff section is not required to participate in this exercise

Table E2

Trial schedule

Day/Time	Event	Audience
Friday		
1800-2000	OPORDs Review/Workstation Operators Training	All
Saturday		
0800-0830	Workstation Familiarization Exercise/Officer-in-Charge Orientation	All
0830-1100	Execute Staff Transition Table	All
1100-1200	*Lunch*	
1200-1600	Execute Staff Integration Table	All
1600-1700	End of Day Hot Wash	All
Sunday		
0800-1200	Execute Command Post Table	All*
1200-1300	Final Hot Wash	All
1300-1330	Site Recovery/Departure	All

*Note: The EN staff section is not required to participate in this exercise.